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Using a Ford as an Airplane-Tender

It could be done if the tender were designed to offer the least possible resistance to the air

By Carl Dienstbach

FROM afar comes the rolling thunder of the field guns, heavy blasts marking the rhythm of the heavy artillery. The sharp staccato of the machine guns and the spiteful cracking of the rifles cannot be heard so far behind the battle line. Undisturbed by the distant din and turmoil the birds are singing, feeding and making love as if there were no such things as bloody war and destruction.

Suddenly their singing, twittering and chirping cease. Their sharp ear has heard a strange sound to which it has not yet become accustomed as it has to the distant din of battle. It is a whirring sound, at first faint, yet sharp and persistent. As it approaches it becomes louder and more terrifying. The birds flutter around and seek shelter.

A few moments later an airplane of a strange type appears above the treetops, makes a sharp curve and, with a graceful glide, comes to rest upon the clearing which crowns the top of the hill. It is a huge monster. Wings of great expanse and a tail in proportion rest upon a strange big body, streamlined and provided with wheels. The pilot and his machinist descend and from somewhere four other men, wearing soldiers' uniforms swarm out of the body of the big monster. There is some hurried activity and after a few minutes the big body is detached from the airplane, which then, greatly lightened, is ready for its return journey. The pilot and the machinist clamber to their respective places, a hearty "Good luck!" a wave of the hand, and, with a short run the machine rises from the ground and quickly disappears behind the treetops flying in the direction from which it had come a short time before.

The body of the monster, relieved by the busy hands of the soldiers of its streamlining shell of canvas and aluminum, proves to be a Ford, carrying two machine guns and a load of ammunition and provisions, in addition to the gasoline required for a long trip. The shell is folded up and loaded on the car by three of the men, while the fourth is busy around the engine, putting it in shape for an immediate start. Five minutes later the Ford is mounted by the four soldiers and chug-chugs away in the direction of the battlefront.

The scene pictured in the preceding lines is merely imaginary, but it may become actual, if the suggestion of L. R. Carroll, of Roundup, Montana, is adopted and carried through by the government.

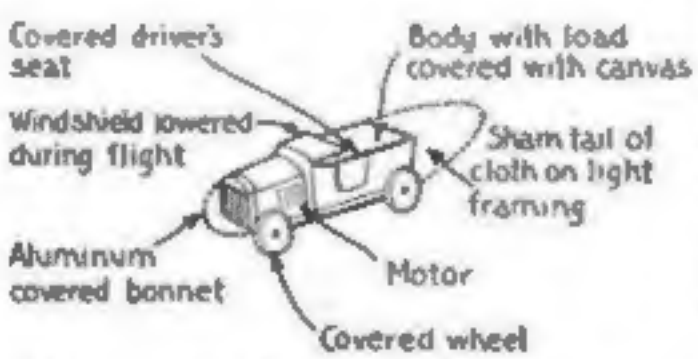


Diagram showing method of streamlining a Ford for easy transportation

The giant flyers of today have ample lifting power to carry a Ford together with its cargo. Aerial transportation does not balk at the weight to be carried, but at the indifferently

shaped bulk of the load. A narrow motorcycle may be lashed to an airplane, as it is, but any ordinary automobile would kill the plane's supporting power by the inordinate head-resistance it offers to the air. Racing automobiles have recently been designed with great care, so as to reduce the resistance they offer to the air, a policy which, in racing, is as vital as in flying. A racing car may be lashed to an airplane as readily as a motorcycle.

But a Ford car is not built on racer lines. The Ford would first have to be thoroughly streamlined and its wheels would have to be changed to disks by spoke-coverings. The problem still remains of providing an extra set of wheels for the airplane on which to restart and to reland after it has dropped its load. But that does not seem impossible of solution, judging from the example of the large German seaplanes, which are transformable into land-planes. These carry a set of wheels that may be lowered at will.

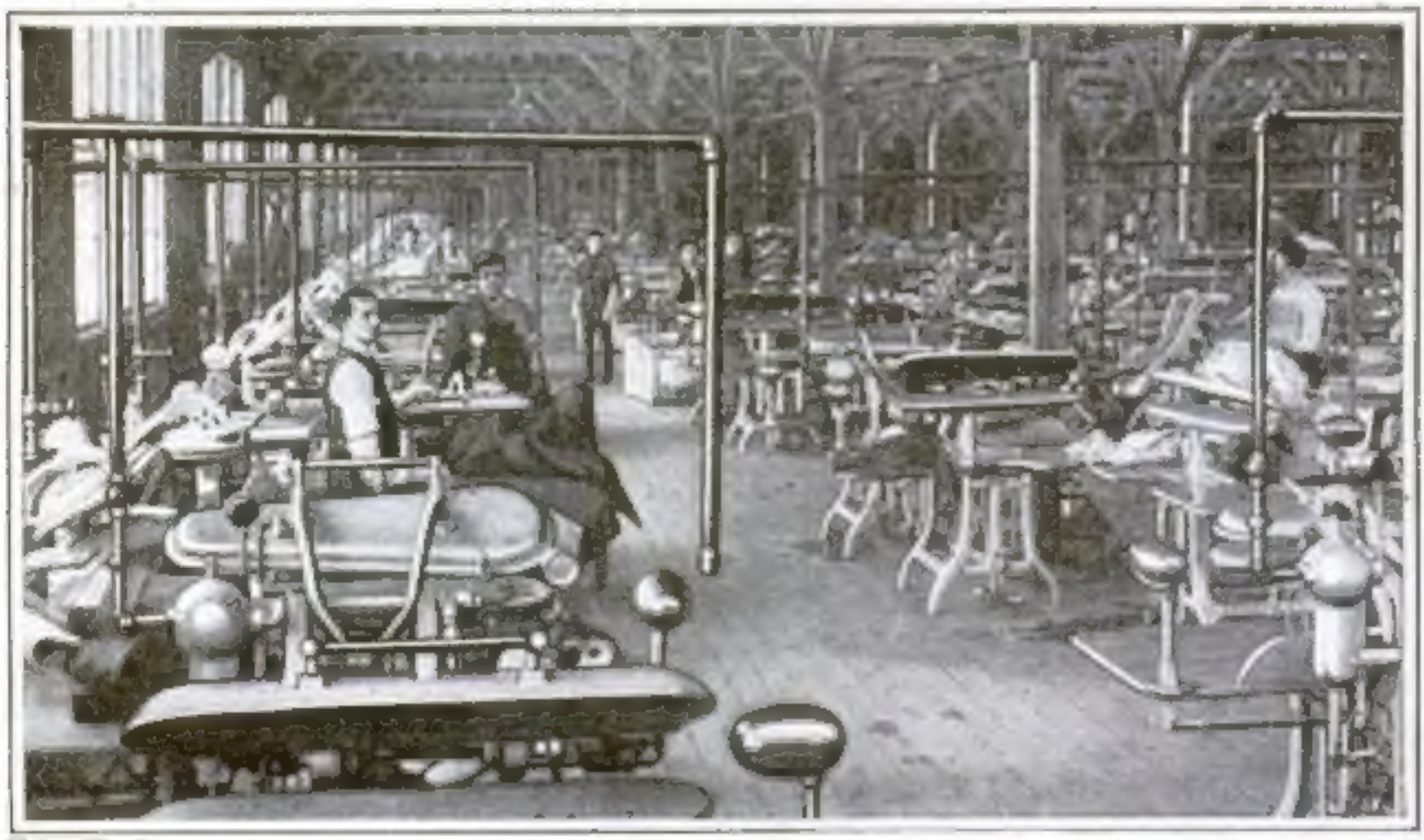
The plan may be carried out with a Ford even more easily than with the seaplane, because the twin-engined planes have their landing wheels under each motor, and the Ford could be suspended between them. The wheels of the Ford could form a landing gear of its own, taking its weight in landing and starting off the structure of the plane.

The Ford would require no redesigning. Light framings with canvas or aluminum covering could transform its outline into a perfect streamline, which would be materially aided by a long empty tail.

Doing the Washing for Forty Thousand Soldiers

ONE of the thousand and one problems which confront the military authorities of a belligerent country is the necessity of providing ways and means for maintaining the cleanliness of the troops in camps or cantonments. The soldiers wear shirts, socks and underwear and use handkerchiefs and towels. All these articles become soiled by use and must be cleansed by washing from time to time to keep the men in good sanitary condition. At Camp Upton, Yaphank, L. I., there are, at various times, from 25,000 to 40,000 men and to take care of their laundry work is a tremendous task.

The accompanying picture shows an interior view of the army laundry at Camp Upton and gives a good idea of the enormous size of the establishment. The machinery shown in the foreground is used for the ironing and pressing of the laundried garments.



© Int. Film Serv.

These pressing and ironing machines and many others are required to do work for the soldiers at Camp Upton, Yaphank, L. I. The laundry work for 40,000 men is a colossal undertaking

Make Soldiers' Waistcoats Out of Your Old Kid Gloves

PATRIOTIC women in America may profit by the experience of their British cousins and follow their example, by devoting their attention to the making of "glove waistcoats" instead of the sweaters which their nimble fingers have been knitting heretofore for the soldiers and sailors of our country. These vests are made of waste material, discarded kid gloves, which cost practically nothing. The lining costs only thirty-five cents. One of these vests can easily be made in a day or two, while the knitting of a sweater takes considerably more time. Another advantage of the glove vests is that they weigh but a few ounces, are less bulky than woolen sweaters, yet fully as warm and more windproof. In addition to that they do not shelter vermin as do the knitted garments. It is to be hoped that American women will see the advantages in this new patriotic work.

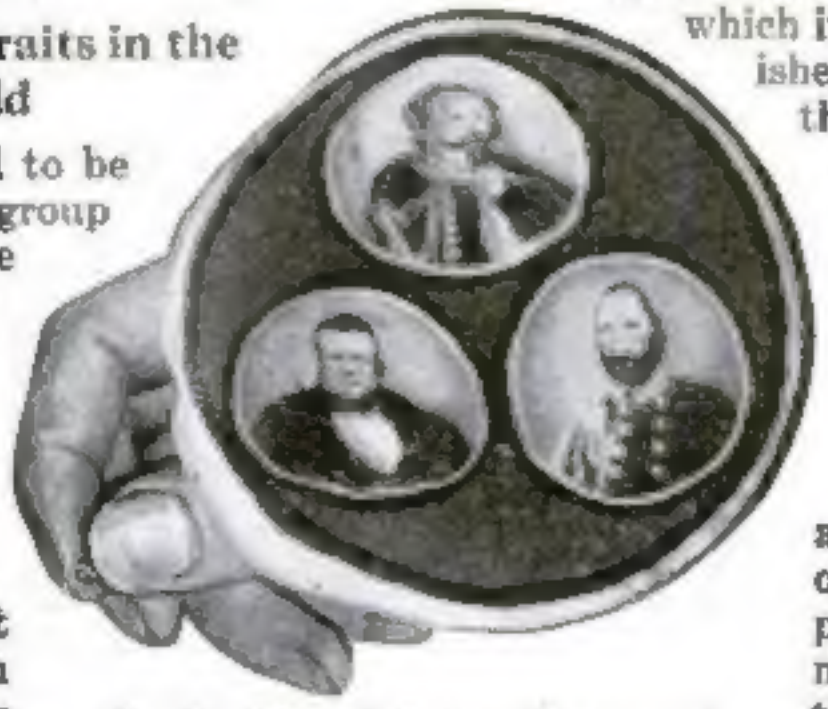
This light, warm, windproof waistcoat is made from old kid gloves at small cost

The Smallest Portraits in the World

WHAT is believed to be the smallest group of portraits in the world, is exhibited in the National Museum in Washington. The portraits are arranged in the form of a cloverleaf and are enclosed in a circular frame about one-eighth of an inch in diameter. They represent King Victor Emmanuel, Giuseppe Garibaldi and Count Cavour and are the work of Jacopo Franchini, a skillful glassworker in Murano, near Venice, Italy, who lived in the early part of the nineteenth century and worked so hard at his strange craft that he died in a madhouse.

The National Museum in Washington has recently acquired a fine collection of marvelous glasswork made by Franchini and placed it on exhibition.

The portraits are of glass and really represent a cross section of a mosaic rod of glass. Franchini's method of making these miniature portraits was highly ingenious. He began by making a mosaic of the three portraits, each in its individual frame and the whole set in a common circular frame. The mosaic was formed of sticks of solid glass of the desired color. After the mosaic was completed, the cylindrical composite rod was welded by heat and then drawn out. As the rod was drawn out it diminished in diameter and the diameter of the individual sticks of colored glass of which it was composed diminished in proportion. As the drawing out was done carefully, the particles of the sticks forming the mosaic remained in their relative positions, or nearly so. A slight distortion could not be avoided, as may be noticed in our reproduction of the portraits greatly magnified. Nevertheless, the results obtained were extraordinary.



Small object between finger and thumb and how it appears enlarged

© Int. Film Serv.

How could anyone resist the mute appeal of these canine helpers in a good cause?

Dogs as Patriotic Helpers in a Good Cause

DURING "Thrift Week" in Los Angeles these two dogs, Spike and Pride, took an active part in the campaign for selling thrift stamps. To say that they were successful only mildly expresses the result of their joint efforts. Spike and Pride made a mute but effective appeal to the patriotism of the crowds. Pride carried a basket filled with thrift stamps, while Spike, carrying a tin box with the inscription "I'm the Cashier," was soon loaded down with the weight of the coins dropped into his cashbox. The two dogs together disposed of hundreds of stamps every day and thus bravely helped the good cause.

No More Rubber Tires in Germany —Except for the Kaiser

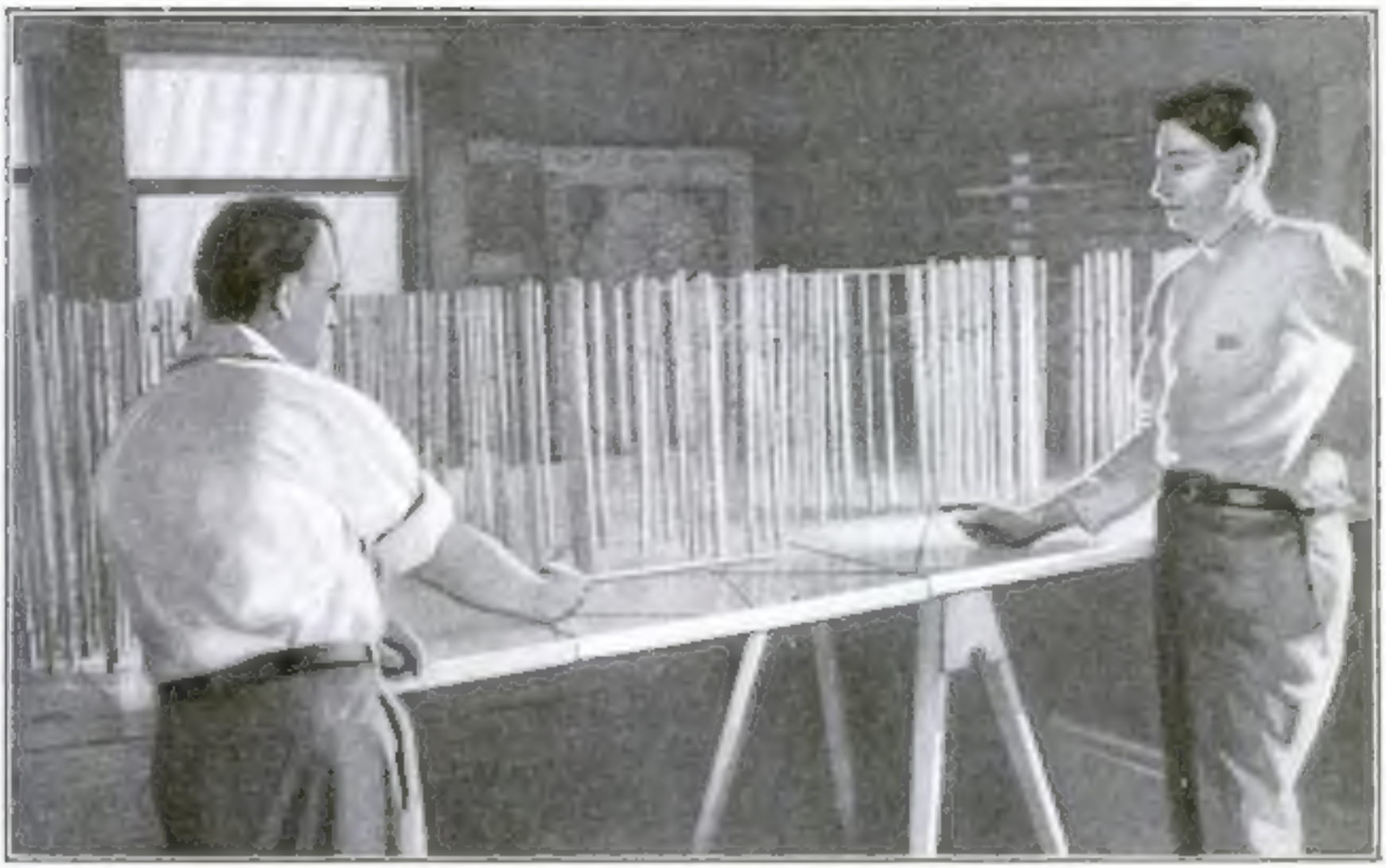
GERMANY had a little rubber in the early days of the war, but she soon became reduced to smuggling in what she could through the mails. Great Britain soon closed this channel, also the traffic in automobile tires which were being imported through Sweden. Now, only the Kaiser rides in an automobile boasting real rubber tires. Everyone else has to bump along on tires filled with cork, paper or even rags.

Locating Splinters Made Easy By This Device

TO one of the New York hospitals, located in a district where the manufacture of clothing is conducted on a large scale, so many workers came every day with splinters, parts of needles, and foreign bodies in their fingers, that it became necessary to provide some simple method of locating foreign bodies without resorting to X-Rays. The contrivance shown in the picture was the outcome of some experimenting by the house physicians. It has proved to be of great assistance in numerous instances since its adoption.

A piece of black woolen cloth, eight inches square, was fastened to a square of adhesive plaster of the same size. In the center an oval opening was made, measuring five-eighths by one-half inch. By placing this over an electric light supplied with a reflector and placing the finger of the patient over the hole, excellent transillumination could be obtained, and any foreign body in the finger easily located. This little apparatus has resulted in a saving, both in time and money, for an X-Ray machine is both awkward and rather costly to operate.

If the finger of the patient is placed over the hole a splinter can quickly be located



This forest of pegs connected by a web of strings gives us a map of geological formation of area represented. The pegs and string indicate plainly sea level and depth and oil sand slope

Making a Geological Map of Wooden Pegs and Strings

THIS map, which is made of wooden pegs and strings connecting them, is six feet and five inches wide and twenty feet and six inches long and represents the geological structure of several square miles of oil land in California.

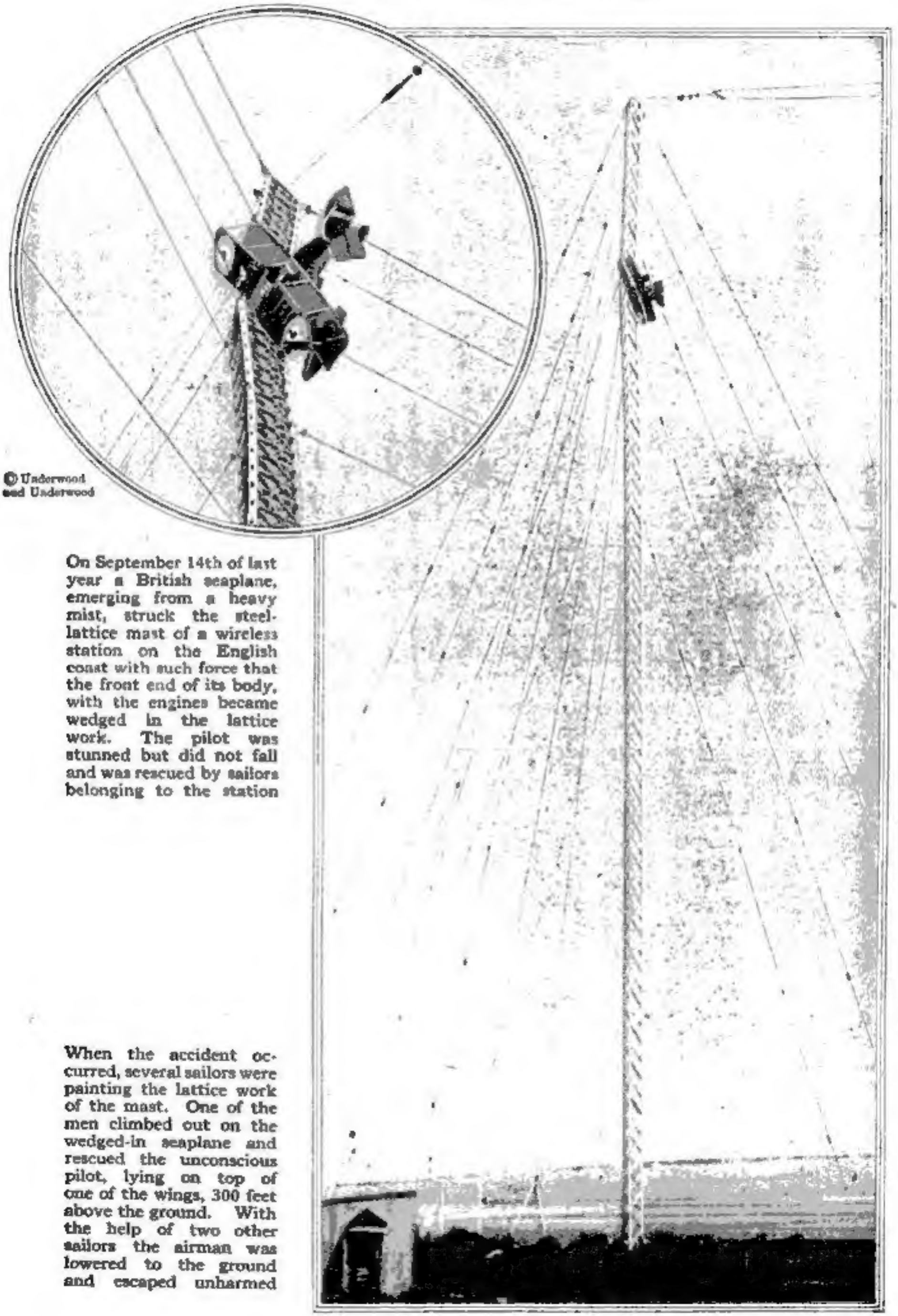
It is claimed that, by glancing at the map one can tell the depth of any well, its exact location, the thickness of the various strata found in drilling, the location of the spots where oil and water were found, etc. The pegs are painted white and have colored rings indicating the geological formations, sea level and depth. The strings connecting the pegs indicate the slope of the oil land, which is about two hundred and fifty feet deep on the west side of the fields and three thousand two hundred and fifty feet on the east side, three miles distant.

This chain visor is designed to protect the eyes from flying splinters

Chain Armor to Protect the Eyes from Flying Splinters

AN ingenious improvement has recently been made to the already familiar steel shrapnel helmet in use "over there." It is designed to protect the eyes and the upper part of the face from splinters of wood, stone, sand and metal, thrown up by exploding shells. The new device is merely an adaptation of the chain doors which have been introduced into metal, chemical and glass works in recent years to protect the workers from the heat of the furnaces and the splashes of molten material. It consists of a fringe of separate short lengths of fairly heavy chain, which effectively arrest the flying particles. On account of its looseness, it does not seriously interfere with the vision. Many cases of blindness among soldiers abroad are due to flying splinters.

As Luck Would Have It

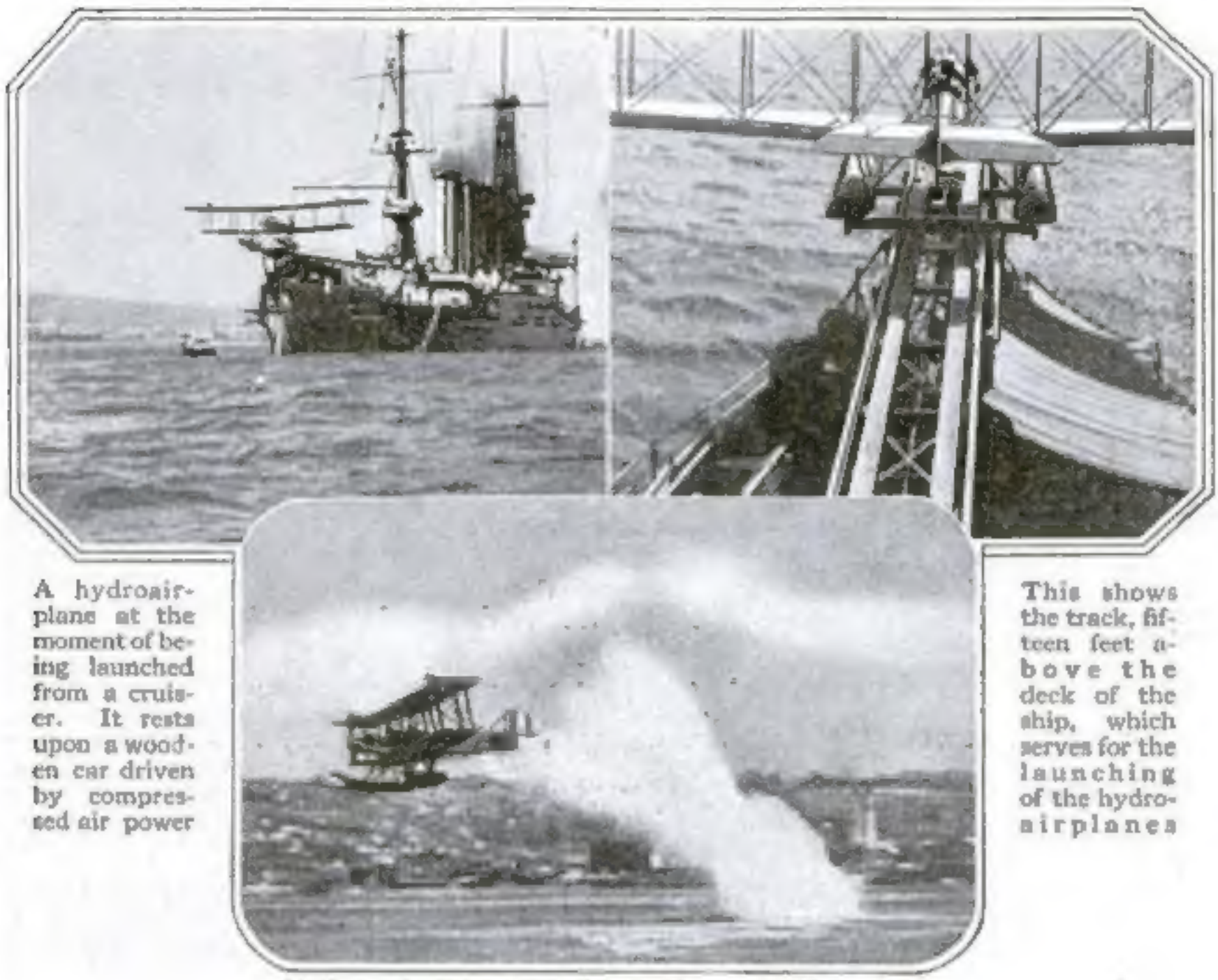


© Underwood and Underwood

On September 14th of last year a British seaplane, emerging from a heavy mist, struck the steel-lattice mast of a wireless station on the English coast with such force that the front end of its body, with the engines became wedged in the lattice work. The pilot was stunned but did not fall and was rescued by sailors belonging to the station

When the accident occurred, several sailors were painting the lattice work of the mast. One of the men climbed out on the wedged-in seaplane and rescued the unconscious pilot, lying on top of one of the wings, 300 feet above the ground. With the help of two other sailors the airman was lowered to the ground and escaped unharmed

How Our Naval Falcons Are Unleashed

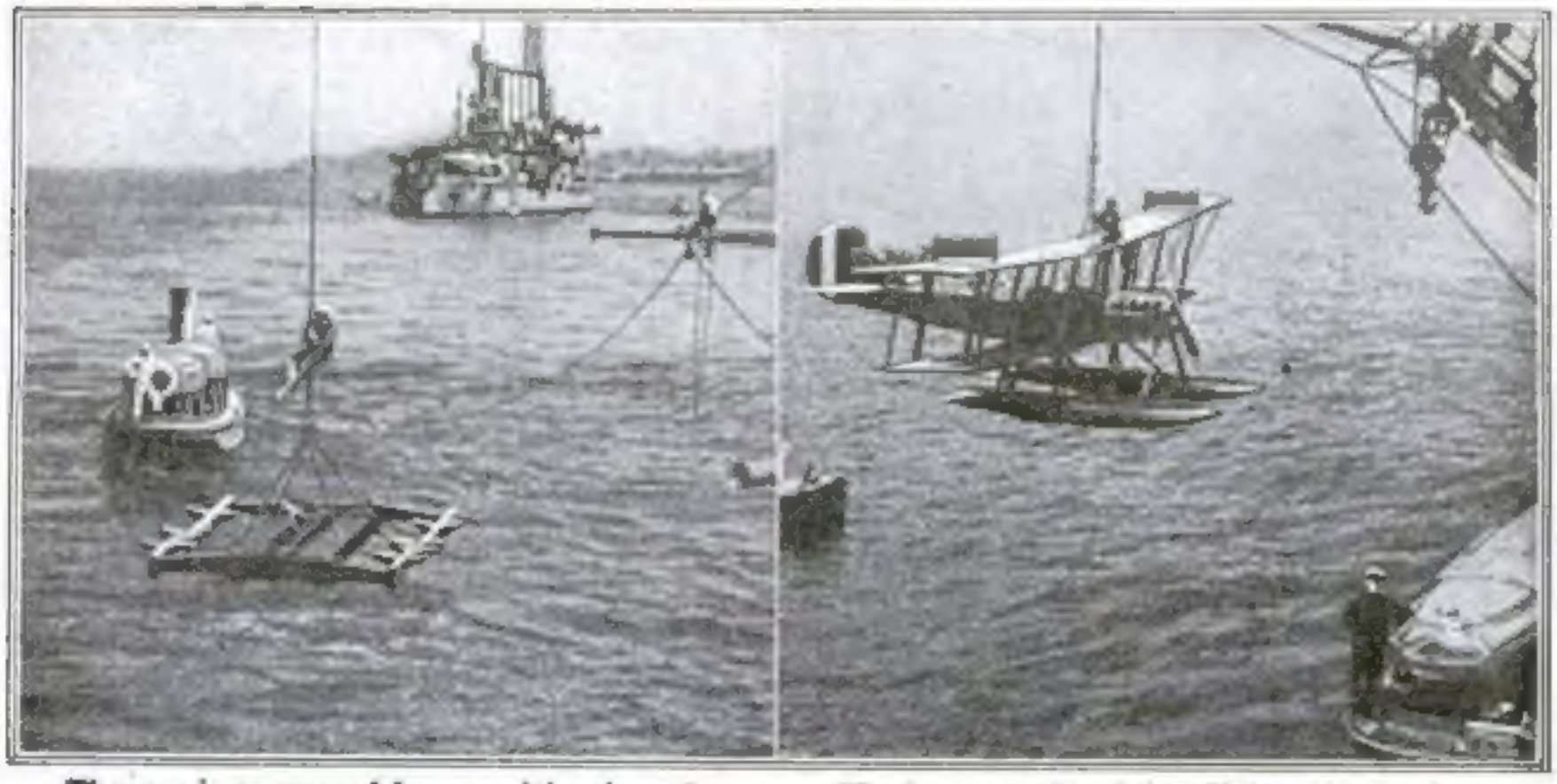


A hydroairplane at the moment of being launched from a cruiser. It rests upon a wooden car driven by compressed air power

This shows the track, fifteen feet above the deck of the ship, which serves for the launching of the hydroairplanes

At the end of the track the wooden car, which weighs about 400 pounds, drops into the water with a mighty splash, while the airplane lightly speeds on its way

Photos by Prisma, Inc.



The car is recovered by a waiting launch and towed back to the ship, to be hoisted aboard to be used again at the next start

Having completed its flight, the hydroairplane comes to rest in the lee of the ship and is once more hoisted aboard her

Boston Converts an Armory Into a

Each of the twenty-two wards of the hospital contains twenty beds and has its staff of doctors and nurses in attendance

Some of the sterilizers which form part of the modern equipment of the new armory hospital

Ambulances of improved type are important auxiliaries to a hospital and many are required to deal with emergency calls

Wonderful Military Emergency Hospital

The upper picture shows how the hospital has been ingeniously built into the big cavalry armory. The lower picture shows members of the medical staff and nurses in a group

Sacred as the Apple of the Oriental's Eye

These are not just ordinary elephants. They're the sacred elephants of Candy, Ceylon, and are considered very holy. Here we see them taking their daily bath

Pigeons and cows are also considered sacred in India. Here we see both standing unmolested

Here is the sacred ox resting in a Benares street. Traffic goes around him as he must not be disturbed

Monkeys are also held in reverence. They are believed to be inhabited by souls of dead men

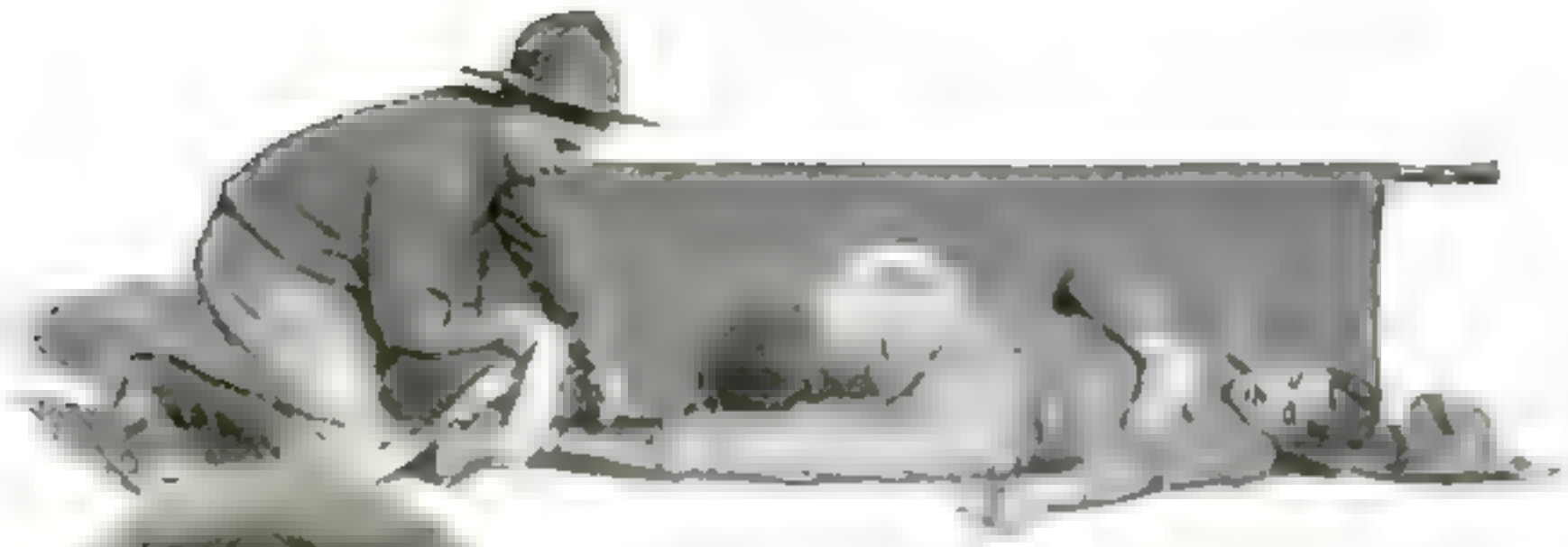
And We Thought We Were Cold and Starving!

Crowds surround the bulletin boards to read the announcements which are posted up concerning the sugar shortage

Firewood was so scarce, that enterprising street vendors sold it by weight to the poor at much enhanced prices

With coal at eighty dollars a ton, the poor people in Paris searched every refuse pile for bits of the precious fuel

New Ways of Using the Military Hand Litter



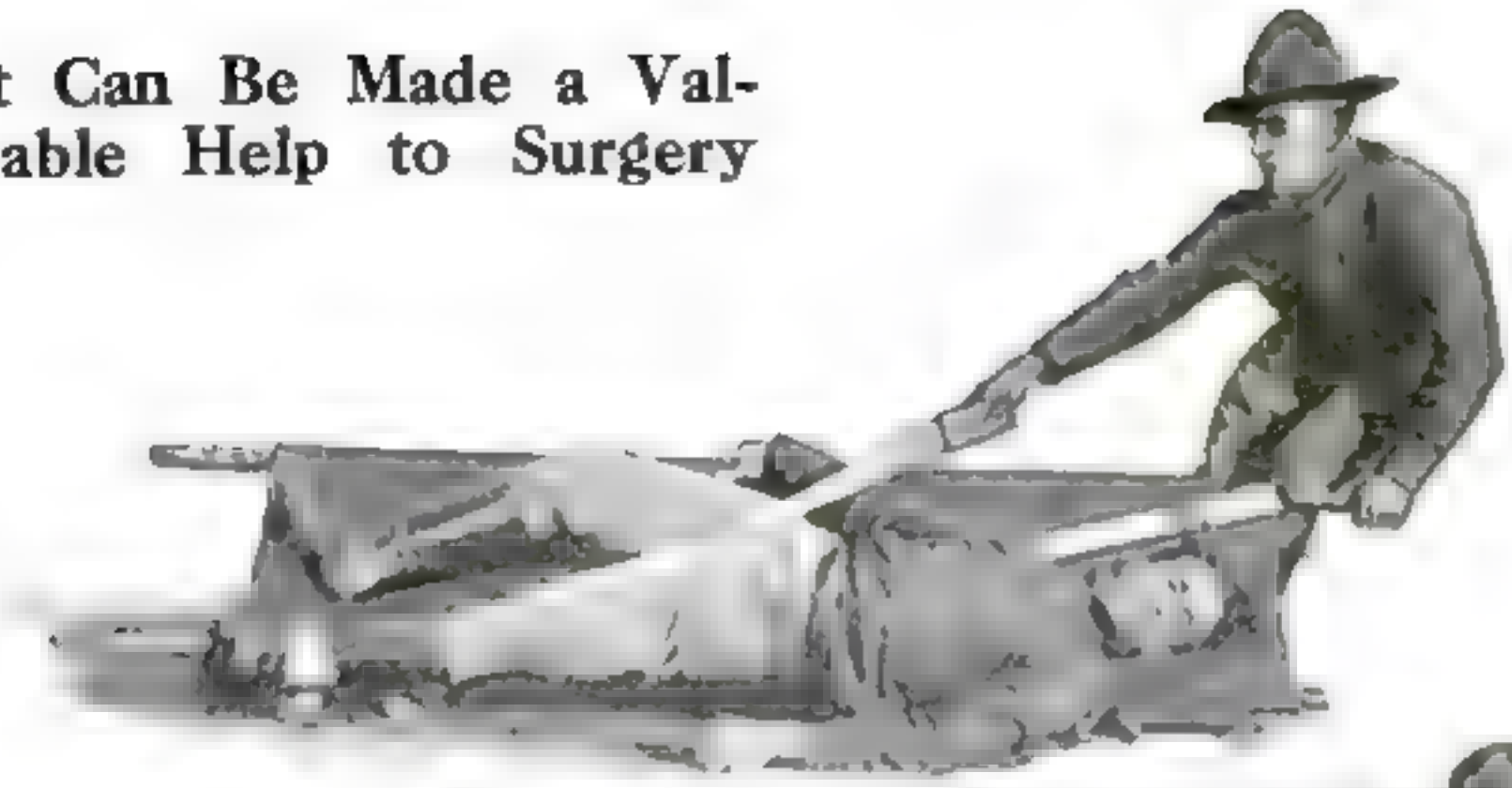
Tying the foot of the injured side with the left front litter sling. The first step toward immobilization

Major H. R. Allen, M.R.C., who has much improved the army litter

By straps and slings the patient is held immovably, even though the litter be turned over completely

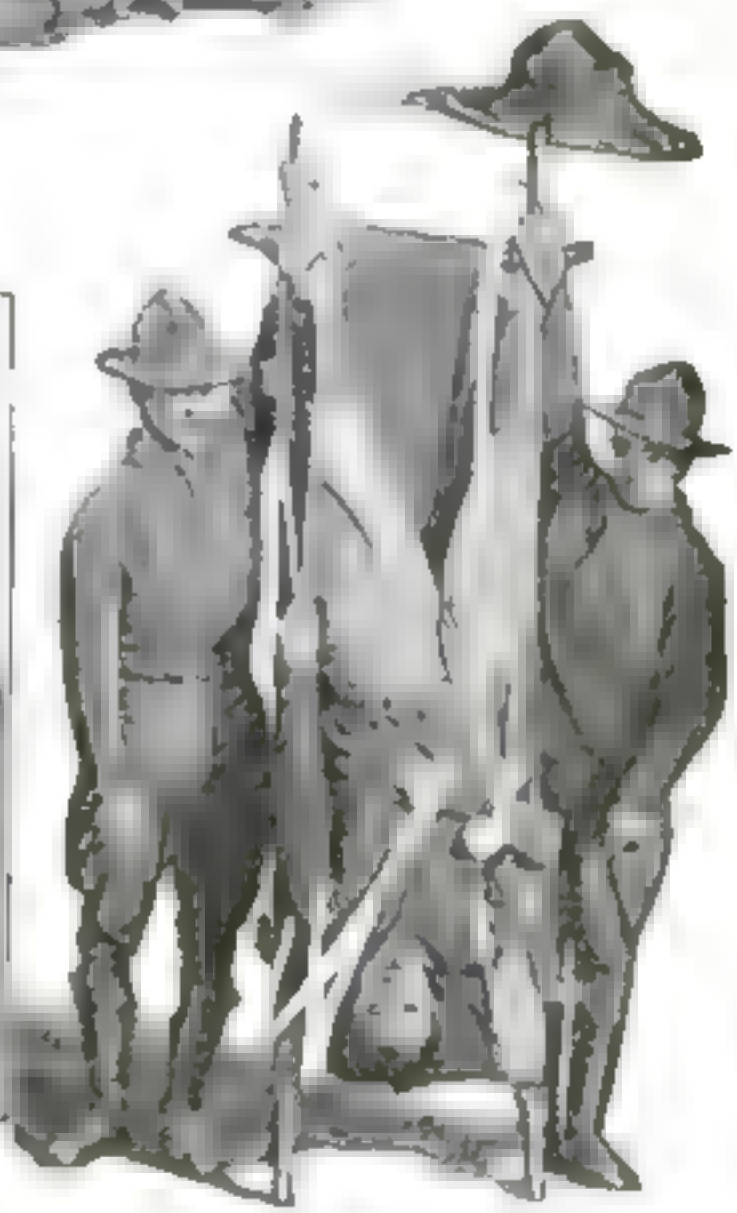
This shows how complete immobilization is achieved, by means of slings, when all extremities of patient are broken

It Can Be Made a Valuable Help to Surgery

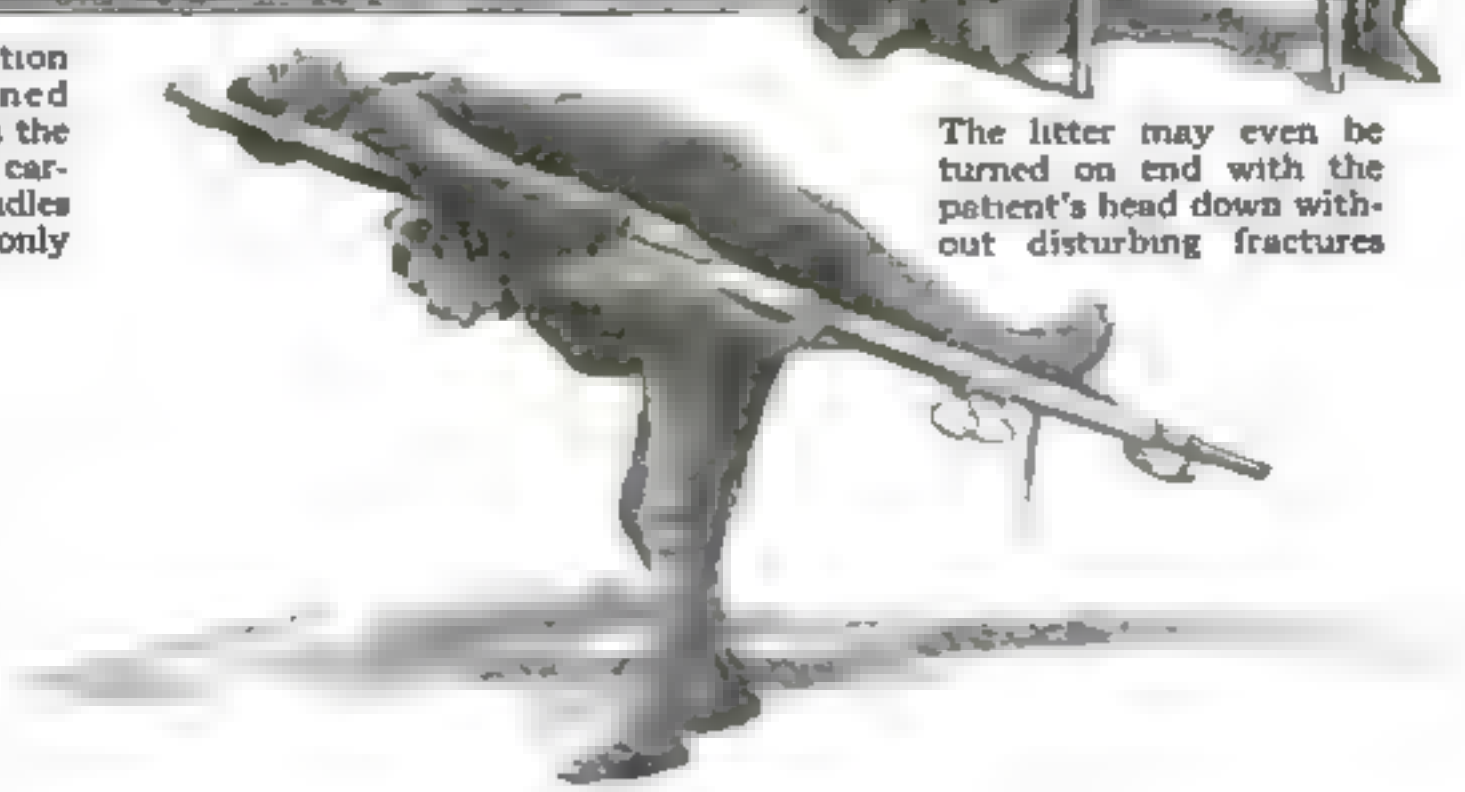


Litter with the patient on it is turned to horizontal position. Second step toward immobilization

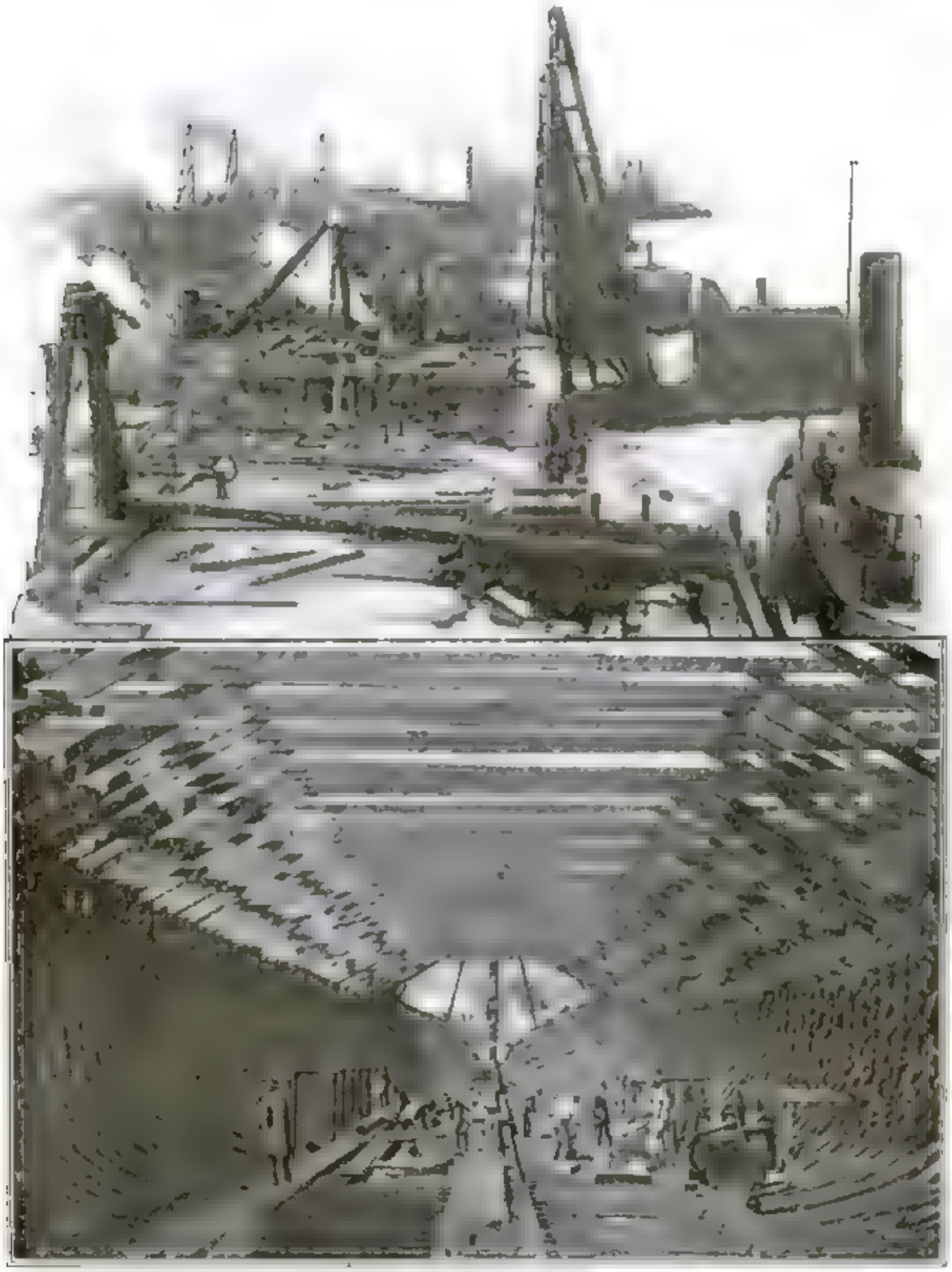
Immobilization is maintained even though the the litter be carby the handles of one side only



The litter may even be turned on end with the patient's head down without disturbing fractures



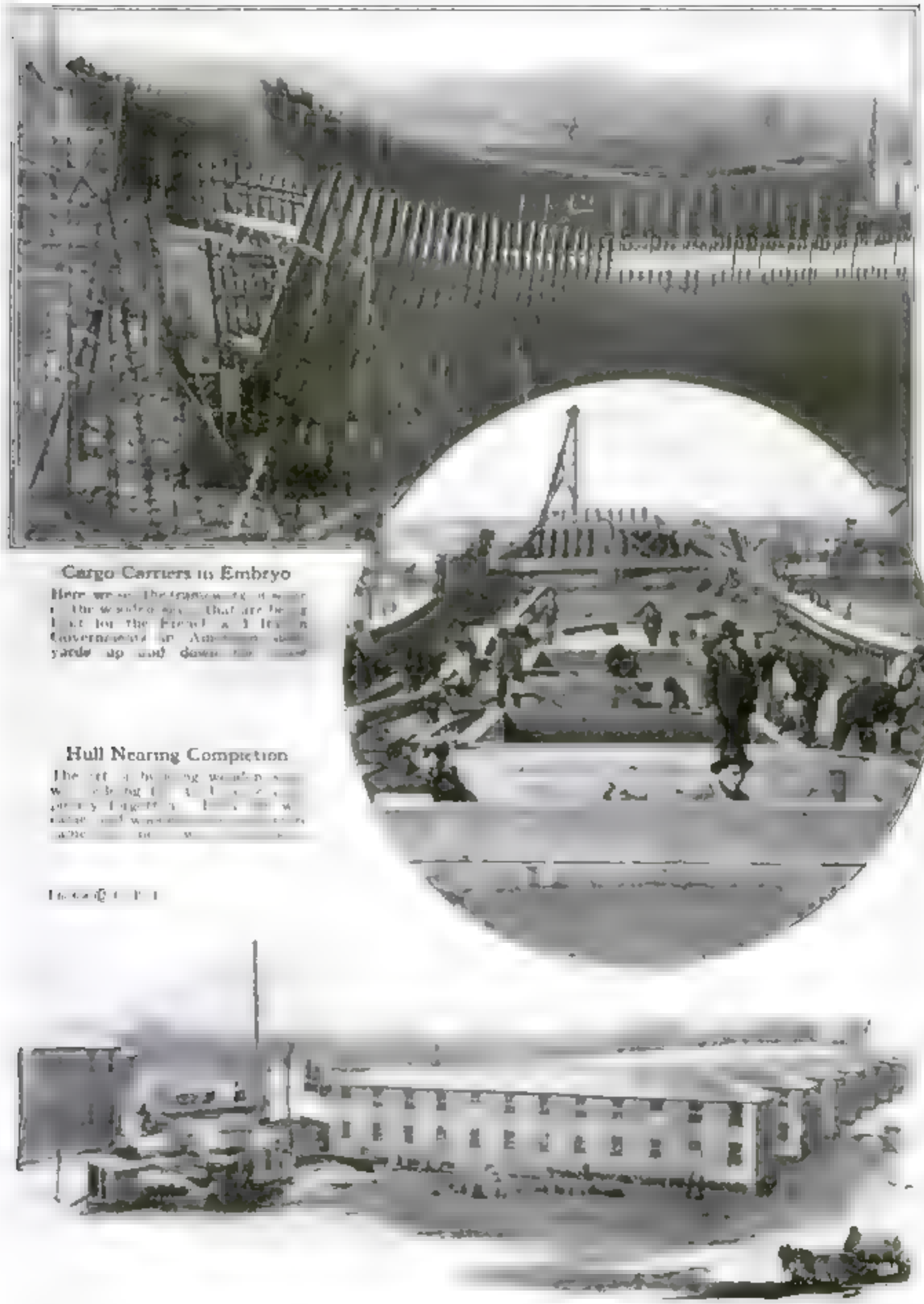
In a case of emergency one man can carry the litter with the immobilized patient on his back without risk or danger



An Obsolete Industry Takes a New Lease of Life at Hog Island

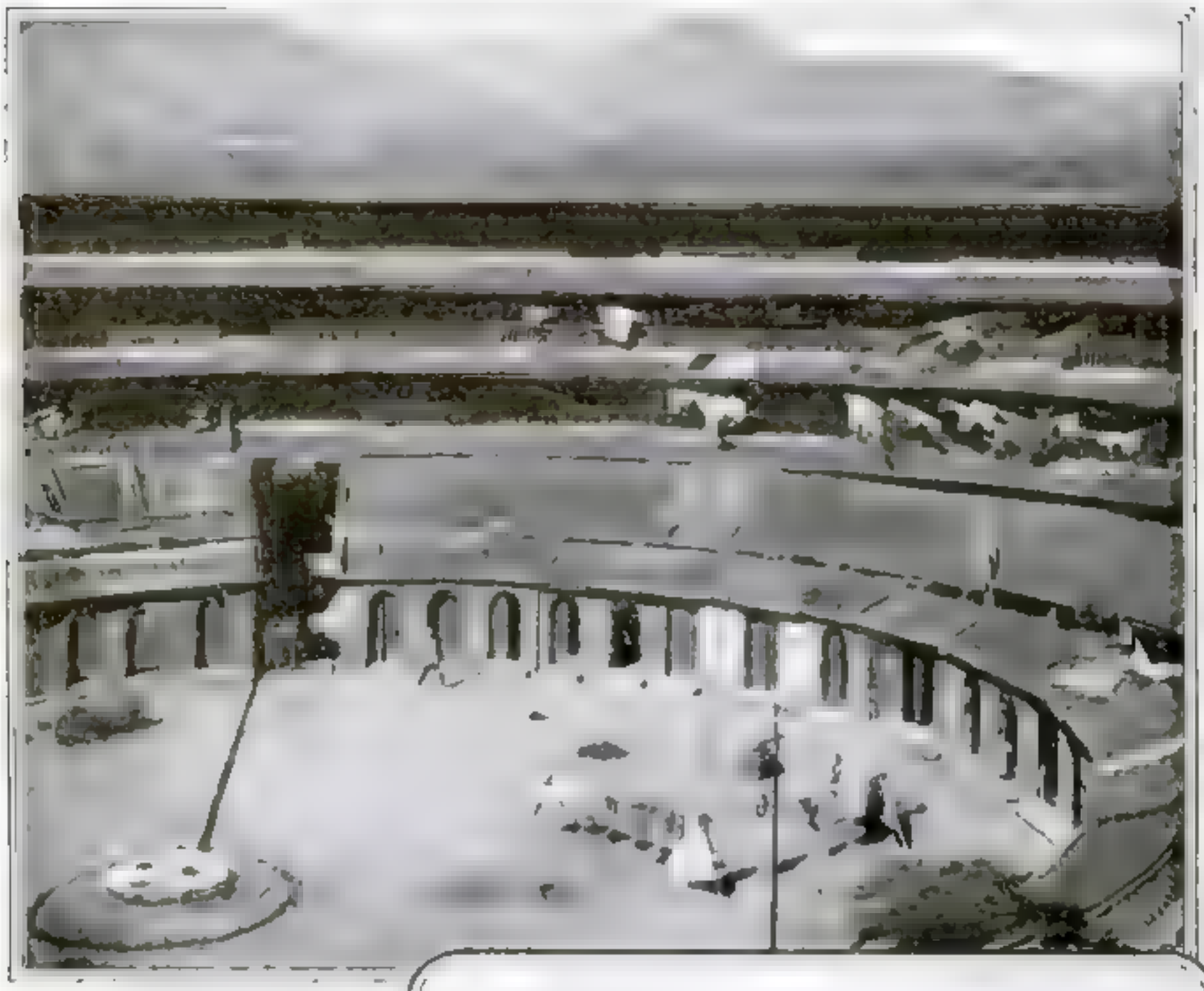
The upper picture shows how Hog Island near Philadelphia, is being converted into the greatest shipyard in the world. It is a miniature city in itself It will have post-office. Y M C A theatre etc., for the use of the employees. The second illustration shows the ribs and framework of an old-style "wooden wall" in making

the Thrill of Life Along Her Keel"



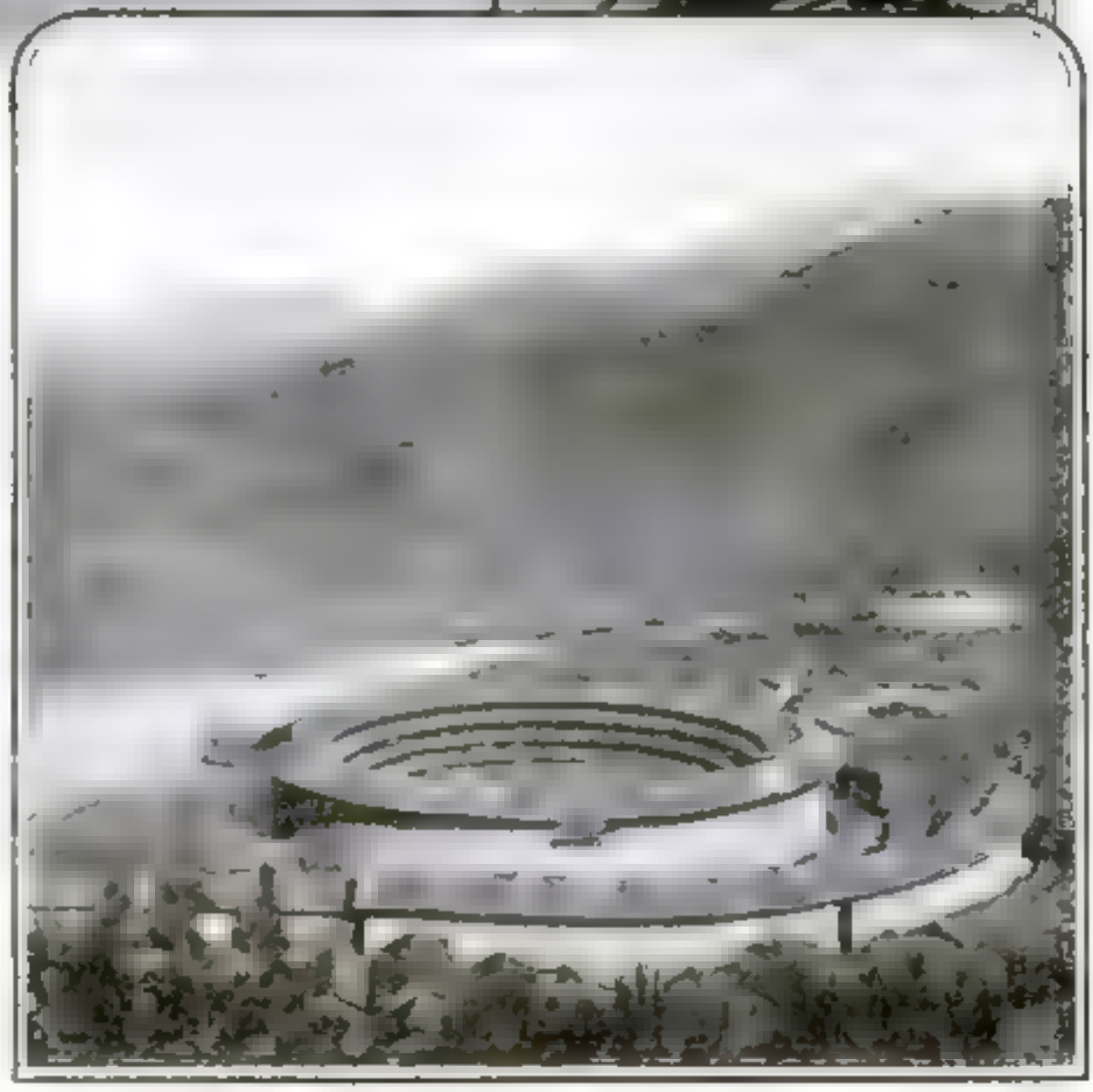
These are the barracks in which the men employed in the new Hog Island shipyard will be housed. The community is complete in every way. It has a Y M. C A., a postoffice, etc.

Were Children and Dogs Barred There Too?

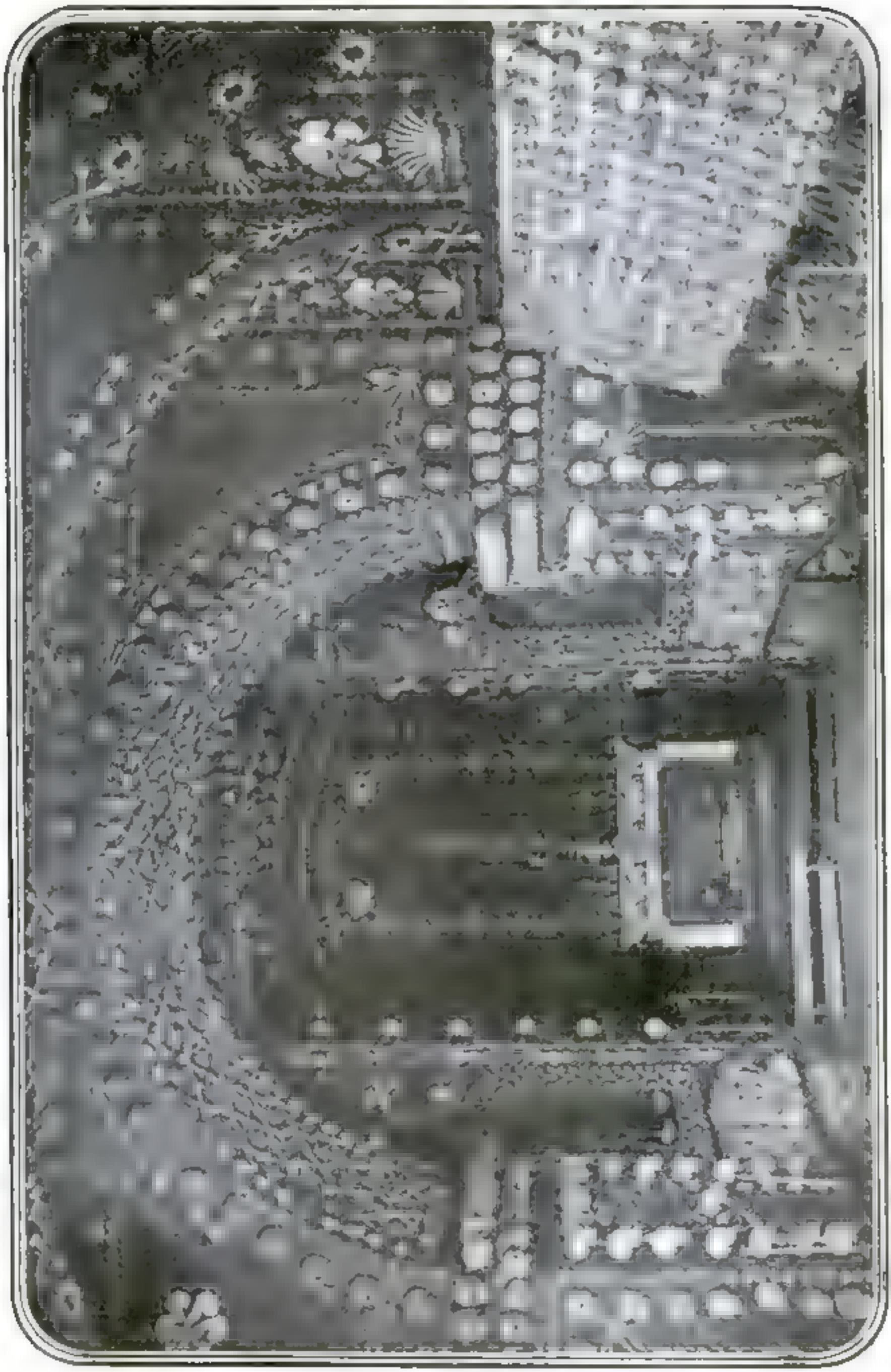


This shows a view of the court and the architecture of the oldest apartment building in the world. It was built in a village in the province of Fu-ken, Southern China, about five hundred years ago and has been in use ever since. The ring shaped building is five stories high and contains four hundred one family houses

All apartments open on the center court, in the middle of which is the cistern, supplying the tenants with water. There are no "modern conveniences" to speak of, but the building is well protected with a strong wall with but a single entrance. There are no windows toward the outside of the circle. A tile roof covers the structure



The Savage Headhunters Outclassed



The Capuchine monks in the convent of Floriana, Malta, had a decidedly gruesome sense of beauty. Underneath the church, which was built by the Grandmaster Verdala in 1584, in an arched crypt, they deposited their dead by nailing their bones upon the walls so as to form a decorative design

The Dove of Peace Is Resting, but

Photos © Int. Film Serv

Carrier pigeons offered to the government for use at the war front are first tried out They must be wise as a judge, swift of wing and of great endurance to be useful

At the training station near Washington, D. C., not only the pigeons but also the men who handle them are trained. The soldier in the picture fastens message to pigeon's leg

The Doves of War Are Active Enough

Under the control of the Intelligence Bureau of the Signal Corps thousands of carrier pigeons are trained for service at the front. The picture shows a row of cotes and above them pigeons in exercise flight

These birds are used to carry messages from the front to the headquarters behind the lines. This picture shows how the capsule containing the message is fastened on to the pigeon's leg for safe conveyance

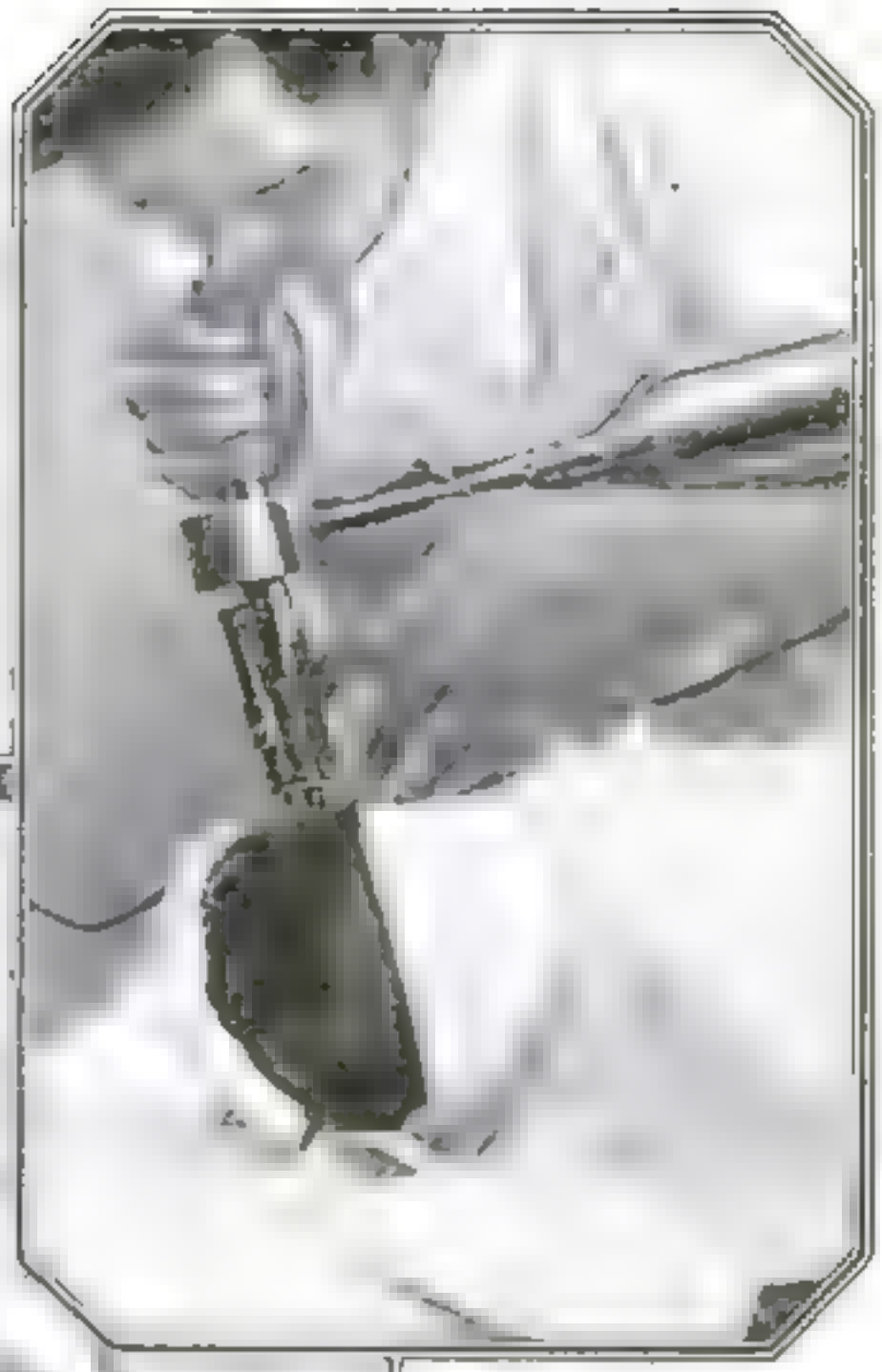
With Drill, Telephone, and Electric Implements the

Using one of the new electric bul let detectors. A bell tinkles when the embedded bullet or splinter is encountered

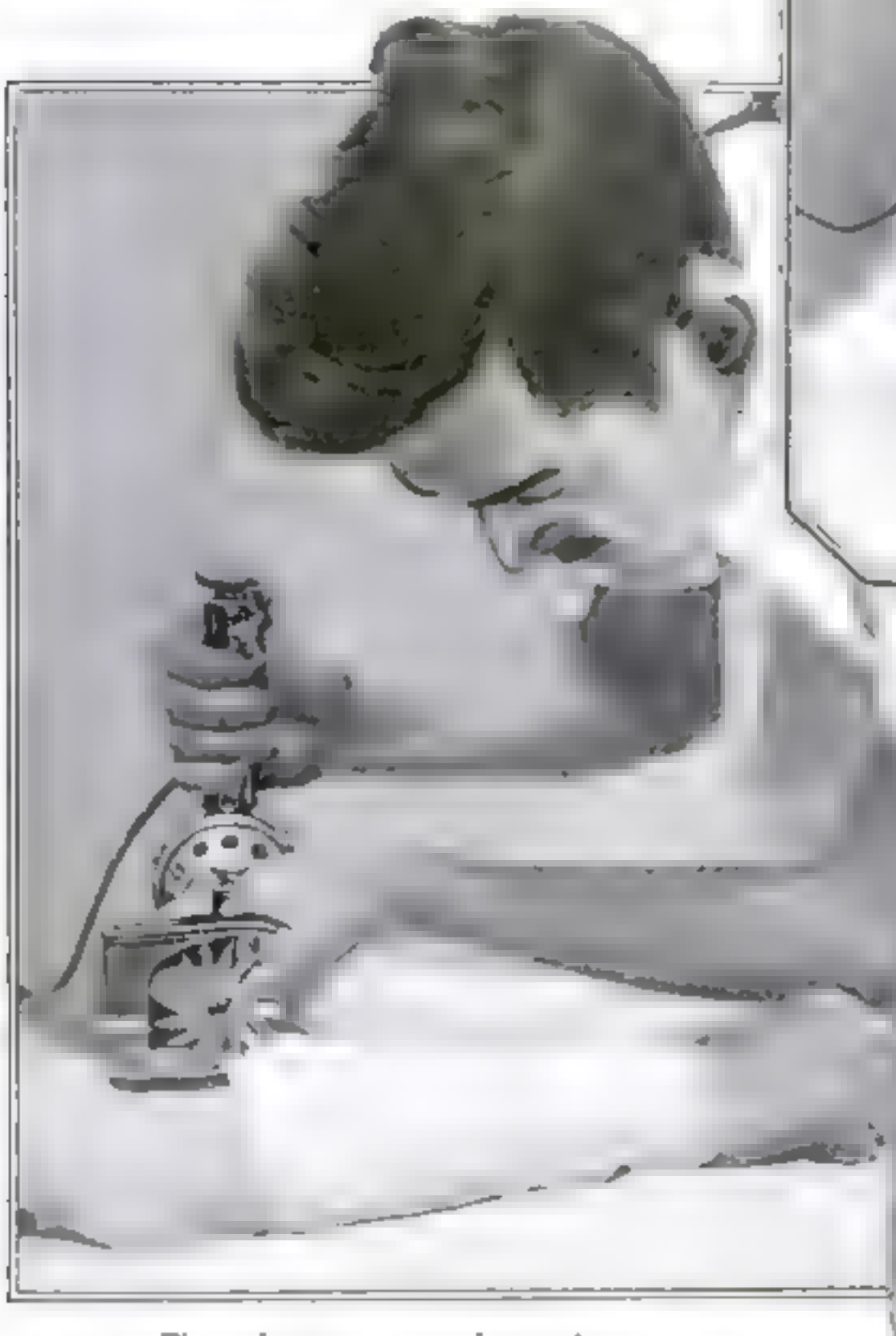
Some simple in struments which are used in prob ing for bullets or shell splinters in the limbs or body

This shows the method of tak ing radiographs of the human head in the mili tary hospitals

Modern Surgeon Salves War's Human Wrecks



Drilling through the skull is made easier and safer by the use of the precision drill This is far ahead of the old style trephine



This electric cutter is used to great advantage in cutting plaster of paris casts when the doctor desires to remove them

The new electric bullet detector is shown here all folded up in its compact carrying case

A Boy Pathfinder Discovers a Bicycle Short Cut in an Irrigation Ditch

SCHOOLBOYS who live near El Molino, California, and attend school at San Marino, travel back and forth on bicycles through a half-mile of concrete-lined irrigation ditch. The ditch "highway" cuts off about a mile of their distance to and from school and enables them to avoid several mean hills over which no cyclists can pedal.

Robert Hutchinson, a lad of about thirteen years of age, is credited with having discovered the path. His boyish spirit of exploration led him to take his bicycle in at the upper end, and ride through the ditch. When he found that the other end emerged at the San Marino Road he realized he had made a lucky discovery. He told his schoolmates about it and since the ditch is dry about nine months out of the year, it has proved a great convenience to the pupils of the school at San Marino. This same spirit of discovery has made the world what it is to-day.

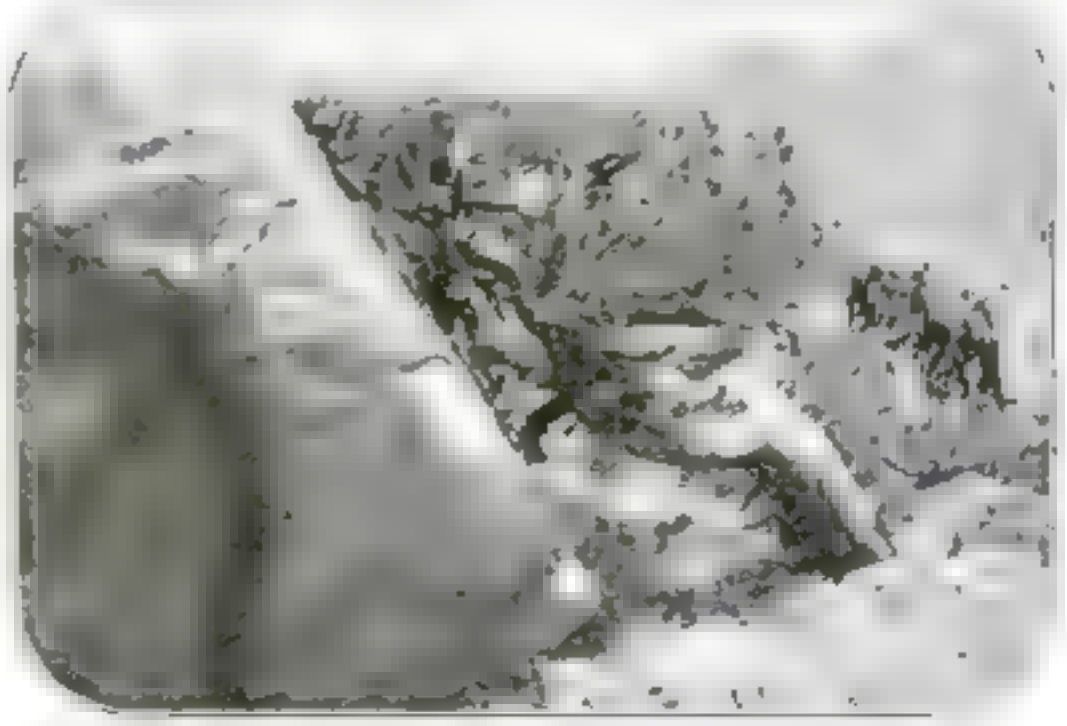
This dry ditch forms a short cut for the schoolboys of El Molino and avoids hills too

Lack of Safe Harbors on Our Pacific Coast

IN a recent publication on "The Neglected Waters of the Pacific Coast," issued by the Department of Commerce of the United States Coast and Geodetic Survey, the Superintendent, E. Lester Jones, calls public attention to the radical differences between the conditions and character of the shore line of the Atlantic and those of the Pacific coast of the United States. While the Atlantic coast and the Gulf coast have many excellent harbors scattered between Maine and Texas, the Pacific coast of the United States, which has a length of about 1,100 nautical miles, has only a few harbors which are available as a refuge for ships in stormy weather. There are no real harbors between Los Angeles and San Francisco, a distance of 367 miles and only five bar harbors, safe in bad weather, between San Francisco and the Strait of Juan de Fuca.

Trees Stunted by the Wind

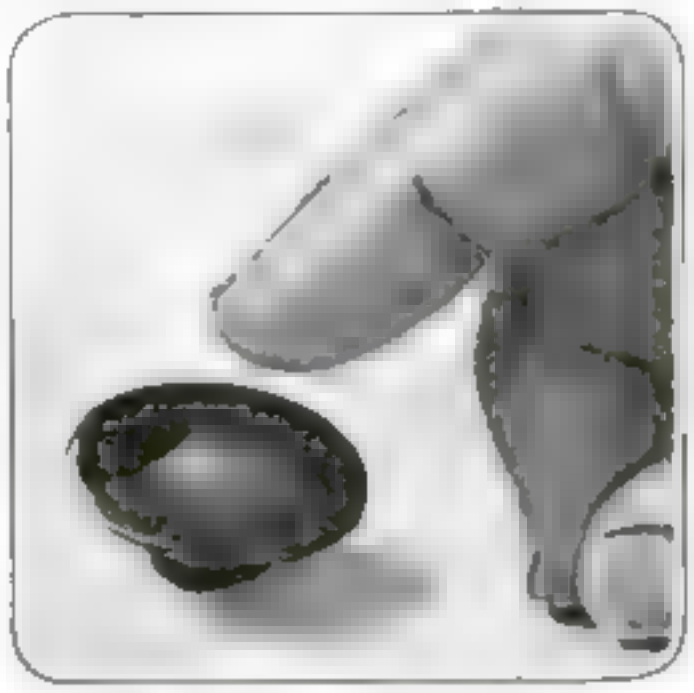
TOURISTS visiting the Rocky Mountain National Park and not afraid of strenuous exercise in mountaineering, often have the opportunity of seeing tree forms like that shown in the accompanying picture. The trees near the timber line seldom grow up straight. They crawl along the ground, seeking the shelter and protection of the rocks against the violent North winds. The tree in the picture found shelter behind a big rock and grew strong and comparatively big, but the height of the rock limited the height of the tree, for it could not withstand the powerful north winds.



Only in the shelter of the big rock could the tree grow in the face of strong winds above the timber line

Constant Friction Made a Freak of Telegraph Key

THE peculiarly formed knob in the picture was taken from a telegrapher's key used continuously for fifteen years by Mr. W. C. Staib, operator in the general offices of the Lehigh Valley Railroad at South Bethlehem, Pa. It is true, the knob is not of stone, but of hard rubber, and was not worn by dripping water, but by the fingers of the operator, but, after all, the cause of the wear in the case of the stone as well as in that of the rubber knob is the same—friction.



This key was worn out by a telegraph operator's finger

Mr. Staib is suffering from operator's cramp and can now use but one finger in sending. In the course of time his finger, by constant friction, wore a deep indentation in the hard rubber, nearly penetrating it. The other fingers of the operator's hand, rubbing against the edge of the knob, wore away part of it, giving the knob an eccentric shape.

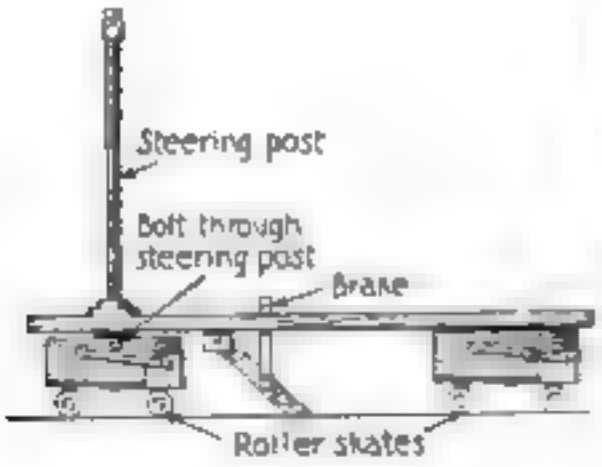
This is just another instance of how a constant small friction will wear out the hardest substances. Everybody knows the time-honored anecdote of the way the rims of the Eastern wells are worn out by the soft rope. There have been many instances of the remarkable effects caused by constant friction, but that of the telegraph key is unusual.

Banana Fiber Bags for Raw Sugar Containers

SUGAR planters in the Hawaiian Islands are facing a shortage of bags used as containers for raw sugar. These bags have been imported from Calcutta. Recently machinery was sent to Honolulu from the State of Washington for the purpose of manufacturing the bags from the fiber of banana tree trunks.

Making a Coaster From Roller Skates

DO boys like coasting? Just ask them, or what is even better, watch them when they have a chance to give themselves up to that sport. Coasting on roller skates is fun, but coasting on one of the regular coasters with foot-board, steering post and brake is, next to flying, pure bliss. Emory S. Egge, of Montgomery, Ala., who invented the coaster illustrated by the accompanying diagram, has a claim upon the gratitude of the boys, for his invention will make it possible for many who could not afford high priced coasters, to indulge in the coasting sport. The device is extremely simple and can be used with any pair of roller skates. The skates are attached to two blocks underneath the footboard by strap and clamps. The rear block is fastened to the footboard, and the one in front to the steering post. The brake, a plain lever arrangement, is worked through a slot near the steering post.



Homemade coaster made from board and pair of roller skates

Portholes in an Airplane Hull

The engines are carried separately and the pilot occupies the fuselage alone

A Real Aero-Cruiser with an Enclosed Cabin to Shelter the Crew

This new Morane-Saulnier biplane carries two machine-guns and three passengers. Note that the engines are carried not in fuselage or body as usual, but are independent of it. The fuselage itself is provided with portholes to admit light and to permit observation. The two funnels are used for taking photographs

EARLY in the war high-powered, weight-carrying airplanes appeared which were driven by two engines. But the engines were not housed in the fuselage or body in which the pilot sits, but were actually separated from it. The system has since been improved, as the accompanying photograph shows.

As soon as the engines are taken out of the central fuselage or body, new possibilities begin to appear. The designer has full liberty to shape his fuselage as he pleases. Since it no longer need house machinery, it becomes a regular ship's cabin with portholes.

In the accompanying photograph of the three-seated French two-engine biplane which has been designed by Morane-Saulnier works, the last stage in this development is presented. The plane itself is of rather average size, and yet it is driven by two light but high-powered rotary engines. It must be a speedy machine because of its sheer power and lightness. When the engines are taken out of the central fuselage and mounted between the planes at either side of that fuselage, there is always a saving in structural weight. In the interest of high speed, the fuselage is made deep enough to enclose the three passengers completely so that they are well sheltered from the icy blast that accompanies fast flying at high altitudes.

But how are the men to see? Obviously by portholes. And so we find that the walls of the fuselage are pierced with some fourteen portholes covered with artificial mica (cellon).

Two of these portholes are set in curious short funnels projecting from either side. Obviously they are intended to give a lateral view. But the funnels, useless to an observer, serve to house a long-focus camera and to protect it from the wind. Thus it becomes possible to take photographs in any direction.

Most of the portholes are used to throw light into the fuselage; only the upper ones are needed for observation.

Of course such machines as these could not be used for fighting purposes as they are too unwieldy and too slow of handling.

To Lock the Ends of a Belt, Slip a Pin Through Two Registering Holes

SIMPLE in construction, easily attached and quickly disconnected is a new belt connector which consists of a hinge with a removable pin. One half of the hinge is riveted to one end of the belt, and the other half to the other end. After the belt has been placed over the pulleys, the two ends are brought together, and a rawhide pin is pushed through the alined holes of the hinge. The belt can easily be removed by removing the rawhide pin, which holds the two parts of the hinge together. The connector provides a flat and flexible, yet sufficiently strong joint for narrow belts.

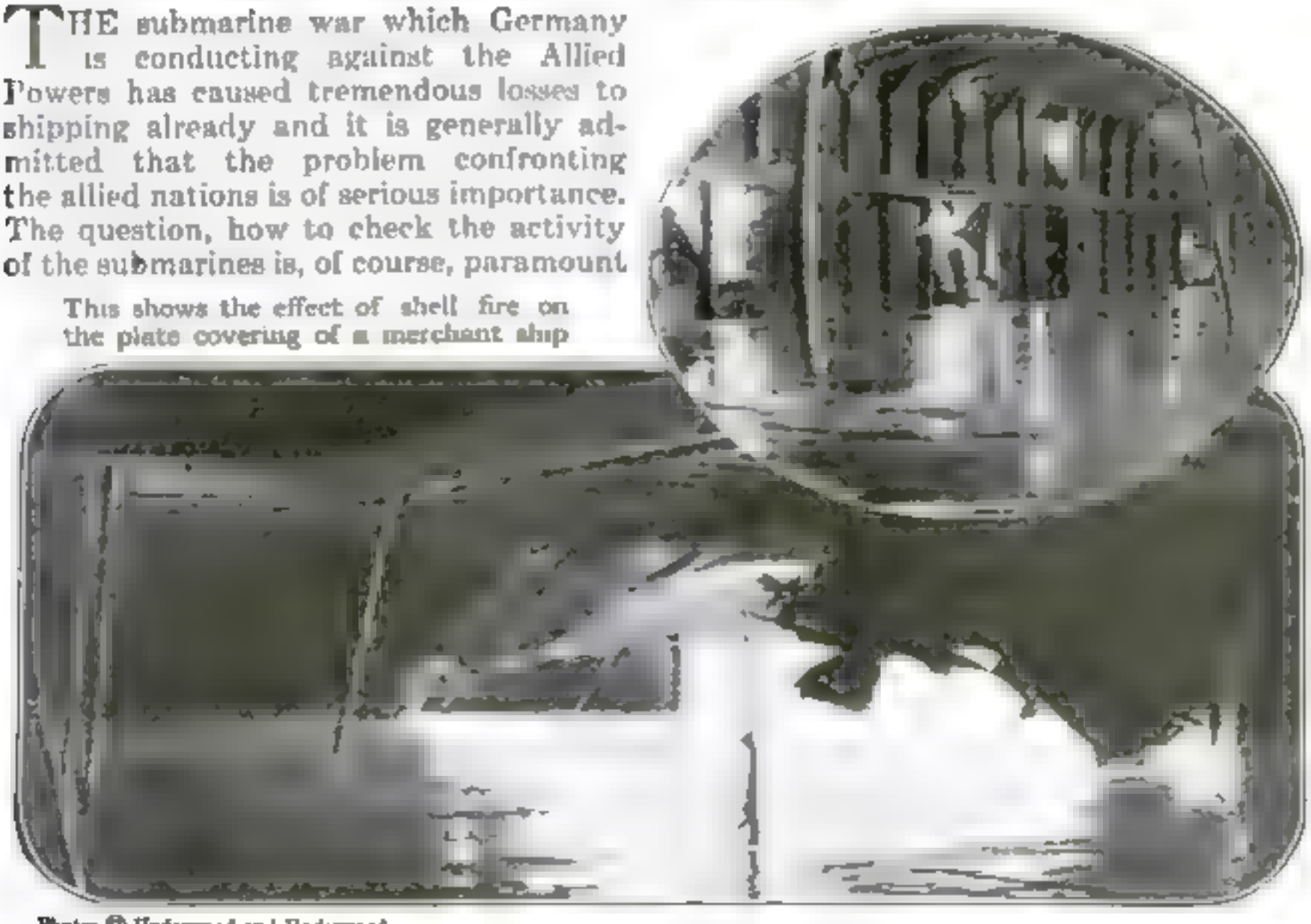
Push in the pin and the belt connection is made, forming a strong, flexible joint

Watertight Compartments to Protect Ships From U-Boats

THE submarine war which Germany is conducting against the Allied Powers has caused tremendous losses to shipping already and it is generally admitted that the problem confronting the allied nations is of serious importance. The question, how to check the activity of the submarines is, of course, paramount but next to it comes the question as to how best to protect ships from sinking after they have been attacked by a submarine and torpedoed. The naval authorities of the allied countries are wrestling with the problem of waging war upon the German U-boats, while the ship builders are called upon to find a solution of the second problem.

The accompanying two illustrations, showing the extent of the damage caused to French ships by shell fire and a torpedo form a powerful argument in favor of the use of watertight compartments in the construction of freight-carrying merchant ships. Ships equipped with such compartments will remain afloat a long time and may be able to reach the nearest port in safety, instead of sinking in a few minutes after the attack as in the case of so many well-known boats.

This shows the effect of shell fire on the plate covering of a merchant ship

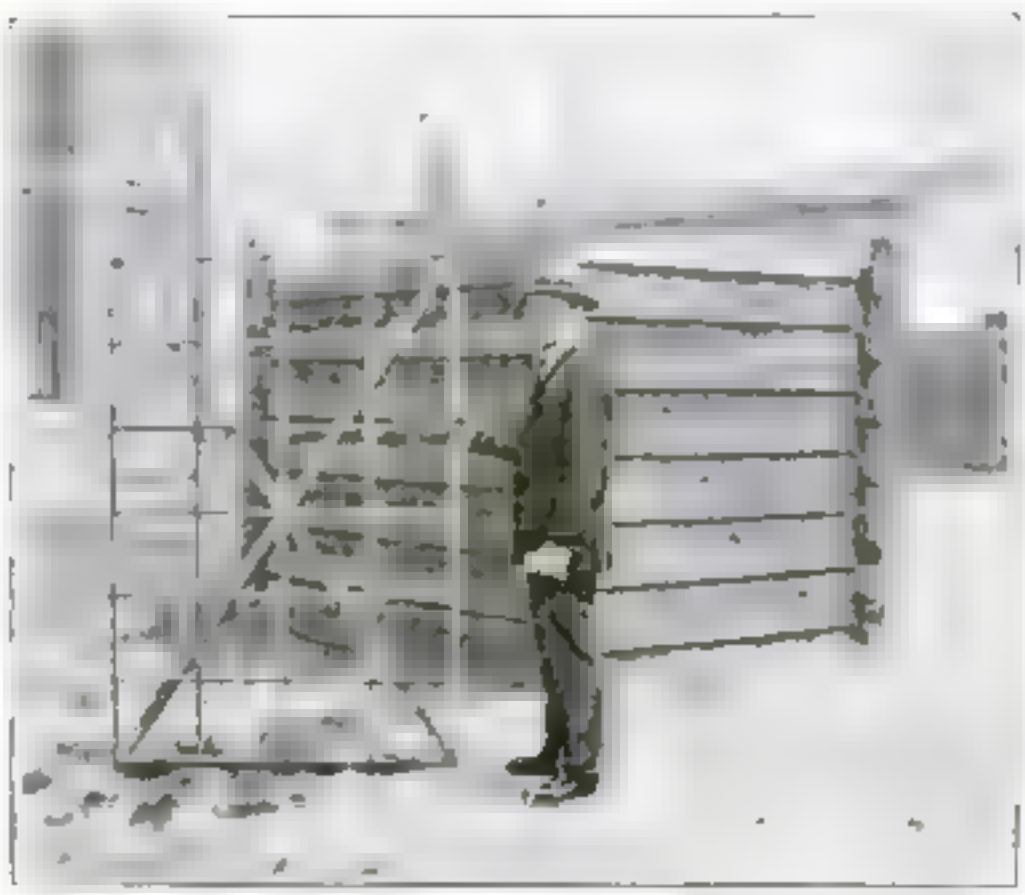


Photos © Underwood and Underwood

Enormous hole torn in the side of a merchant ship by the explosion of a torpedo

Growing Thirty-Five Bushels of Potatoes in a Six-Storied Box

TALK about growing potatoes in your back yard! Here is a method by which you can grow thirty-five bushels of tubers in a six-by-eight-foot packing-box. It looks like a big pen, but it is a very old thing in the way of potato farms. The western miners have known about it for many years. Now they are passing it on to the eastern folk



A potato farm built on the apartment house principle. Each floor is six inches high and contains one layer

The pens are built of heavy timbers and open spaces are left on all sides to permit the plants to force their way through. The "soil" consists of rich earth and manure with a mixture of hay or excelsior, and each bed is about six inches deep. Potato plants are placed in the first layer of soil and in each layer until the top is reached. The farm is built on the principle of the apartment house, potatoes growing on each floor.

When growing, the plants reach out in all directions, including straight up. When they are fully grown the pen is taken apart and the potatoes are rolled out of their thin covering of soil with a rake, so that they are not bruised and cut. One bushel of potatoes is sufficient for planting. A yield of thirty-five bushels to each pen is the rule rather than the exception. This idea might very well be adopted by city-dwellers here in the East, for the large supply would make potato famines non-existent.

Sun for Ripening Bananas? Certainly Not—Just Cool Them

SUNSHINE is not in the least necessary for ripening bananas. All that is necessary is to subject them to a heat of about seventy-eight degrees for about eight or ten hours, and then gradually cool them to a steady temperature of about sixty degrees. This quickly produces a pleasing golden color, and renders the fruit firm and of very desirable appearance for sending to market.

Swinging "Stop" Signal Attracts Your Eye

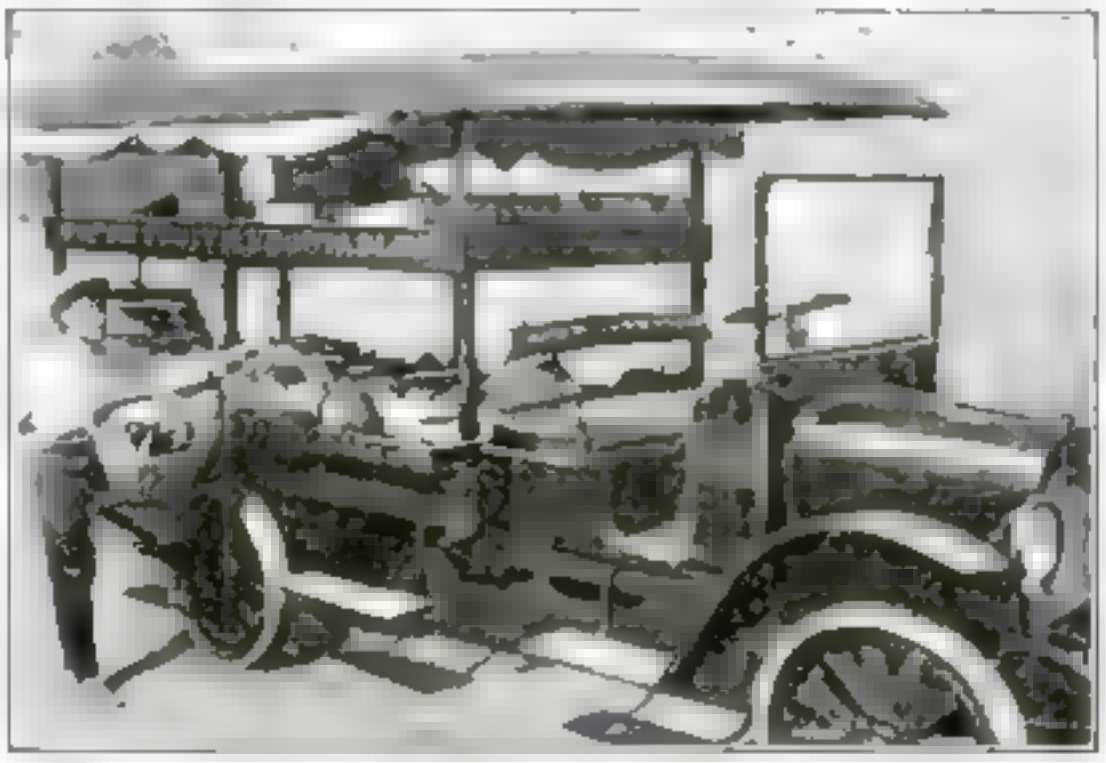
The swinging "Stop" signal will catch your eye readily and stop you

ALL the fundamental principles of safety first are embodied in a signal system for use at grade crossings which has been perfected by a Pennsylvania company. It has three different aspects shown in the accompanying illustration. Under normal conditions the "Stop" signal is concealed behind the "Look! Listen!" sign. When a train approaches, however, the "Stop" signal is released and swings back and forth so as to attract the attention. It is a well-known psychological fact that a moving signal is invariably more effective in attracting the attention than a signal which remains stationary.

If, for any reason, the signal mechanism is out of order and fails to work properly, the "Stop" signal drops down vertically and remains in that position, as a constant warning to all persons approaching the crossing.

The Vegetable Peddler Adopts the Fast Motor-Truck

THE motor-truck is being used in Southern California as a vegetable store on wheels. For some time prior to the use of the truck for this purpose the lowly horse had been used to draw the vegetable wagon up one street and down the next, but so much more efficient is the truck for this purpose that it is being rapidly taken up by California produce peddlers.



California produce peddlers are nothing if not enterprising, and the automobile has, with them, replaced the horse

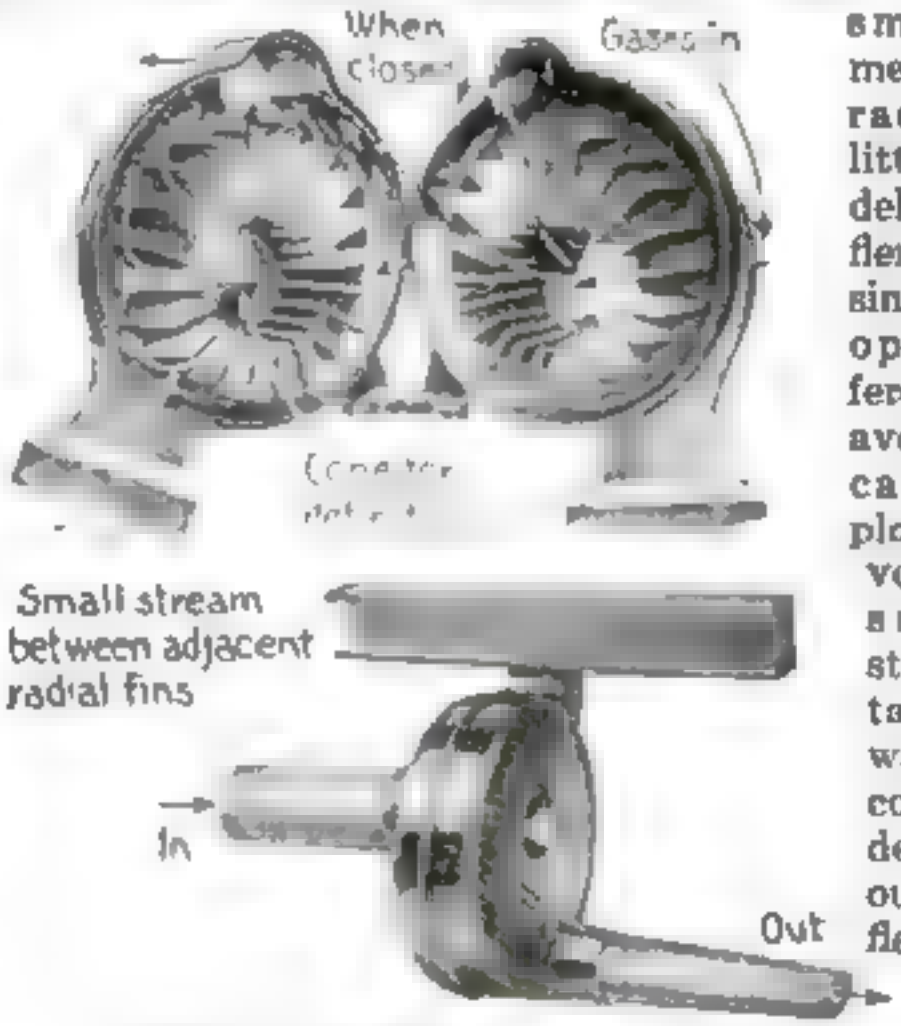
Upon the regular truck platform specially-designed vegetable-carrying bodies are being constructed, the lower deck being the salesroom, while the upper floor is intended to hold the reserve supply. More than thirty per cent more ground can be covered by one of these vegetable-trucks in a day than by the old horse-drawn vehicle. The result is increased profits, a neater appearance and much time saved.

The bodies are of the "quick detachable" variety, so that it is a common sight to see a vegetable vendor and his family touring on Sundays and holidays.

In fact, the money invested in such a motor-truck is considered well-spent by the peddler.

New Automobile Muffler Works on Vacuum Principle

ALL automobile engineers have admitted that the present type of muffler in which the gases are allowed to expand from a small pipe into the muffler and are then carried back and forth through passageways, is inefficient because it increases the engine back-pressure and prevents a rapid exit of the burned exhaust gases. The new muffler is a noise-deadener because it prevents the sudden expansion of the compressed gases to the lower atmospheric pressure. The exhaust gases enter the muffler perpendicularly and strike against a small conical surface which divides them up into numerous small streams by means of two sets of radial fins. These little discharges are delivered to the muffler exit one by one, since the paths to the opening are of different lengths, thus avoiding the noise caused by the explosion of a larger volume of gas. Each small discharge stream is also in contact with the muffler walls, so that it is cooled and its volume decreased on the way out. With this muffler, the gas engine is able to produce more power and efficiency.



Details and general appearance of the new principle, disk-shaped automobile silencer

Don't Let Your Baby Suck the Telephone Cord!

"HELLO! Hello! Is this the complaint department?" A woman's voice, clearly in a state of great irritation, judging from the rising pitch and the increasing explosiveness of her utterance, almost screamed these words to the complaint clerk of the telephone company. He gave an affirmative answer and, interrupted by queer crackling sounds, and a steady buzz, the voice at the other end of the line poured a string of complaints into his ear.

Bitterly she complained of the operator, of poor connections, noises in the telephone and many other things which, to the experienced clerk, clearly spelled a short-circuit somewhere on the subscriber's line.

This shows how baby caused a short-circuit in the line by sucking the cord

Politely he suggested to the woman to examine the green cord of her telephone and to inform him whether it showed a dark and wet spot.

"Yes, it does," came the answer. "Baby was playing with the cord this morning and took it in her mouth, sucking at it for a while. Surely there can be no harm in that!"

The complaint clerk, who had heard the same story many times, was callous. Irate ladies who complained of the service and possessed babies were as nothing to him. If people did foolish things and then upbraided the company, why should he care?

Placidly he informed the complaining one that the baby, by sucking at the cord, had caused a short-circuit somewhere in the line. The insulating fabric around the wires, when thoroughly moistened, had become a conductor of electricity. He advised the woman to dry the spot by holding it for a while near a hot iron and not to let Baby suck the green cord again, unless she was willing to go to the trouble of drying out the wire every time Baby committed the offense.

A New Safety Lock Suitable for Sewing-Machine Treadles

PROBABLY the greatest element of fatigue occasioned by running a sewing machine is that of exerting a constant foot pressure on the treadle while the machine is in operation. To stop the machine, the operator is forced to elevate the sole and lower the heel of her foot. In case of running a needle into the finger, the instinctive motion is to draw away, but she would be forced to make the reverse motion.

Mr. Frank B. Gilbreth, of Providence, R. I., an efficiency engineer, has introduced a device which can be advantageously applied to any sewing machine where the operator does not have to stop the machine oftener than every four minutes. To start the machine, the operator simply pushes her foot down on the treadle. The hooklike device grasps and locks the treadle. To release the lock, the operator has only to drop her foot from the foot rest shown on to the lever. This knocks the catch off the treadle and stops the machine.

This device starts and stops a sewing machine without causing unnecessary fatigue

The first picture shows the Pigeon-Tremex, which destroys trees by boring into them. The second shows the Ichneumon Fly which destroys the destroyer, thereby saving the trees

Even a Parasite May Prove to Be Useful to Man

"BZ-Z-Z-." "Bz-z-z-z-z"—the buzzing sound comes nearer. It is produced by the vibrations of the wings of a most peculiar looking insect. Its body is about two and a half inches in length, with transparent wings marked with dark spots. Hanging straight down from the rear end of the slender body is a thin, hair-like something, about five or six inches long, which seems to interfere with flight.

Clumsily the insect circles around the trunk of the big elm tree. The buzzing ceases. The insect crawls around the trunk for some time before it stops.

Without further preliminaries the queer insect raises its threadlike appendage straight up, then curves it in form of a loop over its back, so that the sharp tip at the end of it comes down on the bark. The appendage, which seems to have the rigidity of a steel wire, is planted perpendicularly upon the trunk and is drilling a small hole into it with surprising rapidity. At last the drilling ends. With unerring instinct the insect, known as the Ichneumon Fly, has located the burrow of another insect, the large Pigeon-Tremex, belonging to the insect family known as Horn-Tails. The female has drilled through bark and wood with its slender ovipositor until it reached the burrow. It deposits one egg in it.

The Ichneumon Fly is a parasite. It deposits its eggs in the burrows of the Tremex and its larvae, which develop from the eggs in a short time, feed upon and kill the larvae of the Tremex which they find in the burrow. It is the female of the Tremex which drills the tell-tale holes into the bark of our shade trees and deposits eggs in them. The larvae which come from these eggs burrow into the heartwood of the tree unless their career is cut short by an Ichneumon larva.

Reducing the High Cost of Building with Camouflage Lions

MOSES HAMBURGER, of Los Angeles, built himself a new house, and his soul lusted after lions to guard the portals thereof. Accordingly he had built nice inexpensive bodies of laths, fitting them with faces of concrete. Then he planted Virginia creeper with the result that he now has two magnificent camouflaged lions.

This ferocious lion is made of laths and Virginia creeper—cheaper than bronze

Look at it, guess what it is and then read the accompanying article. It isn't a centipede or snake

Have You Ever Found a Thing Like That?

VISITORS to seaside resorts on the Atlantic coast occasionally find in their strolls along the beach, especially after a storm, strangely formed objects like that shown in the accompanying picture. What is it? Many a stroller has asked himself that question, without being able to answer it. The first guess usually is that the queer-looking thing is of vegetable origin, probably some seaweed. Few suspect it to be of animal origin.

This object, which almost has the appearance of a frilled "boa," is the egg-case of *Fulgur Carica*, a sea snail.

The egg-case consists of a series of flattened capsules, attached by one edge to a cord. Each one of the capsules shows, opposite the place of attachment, a more transparent spot, which indicates the place where in due time the young individuals developing from the eggs will make their exit. When laying these long strings, the snail goes beneath the surface, and, as the ribbon begins to be formed, it appears above the sand, slowly increasing in length until the whole of its two or three feet of length are formed. Each capsule contains a number of eggs. The family of this creature is represented by about eight species, from Cape Cod to the Gulf of Mexico. The snail's shell is often more than one foot long.

Lofty French Observation Point Near Dixmude

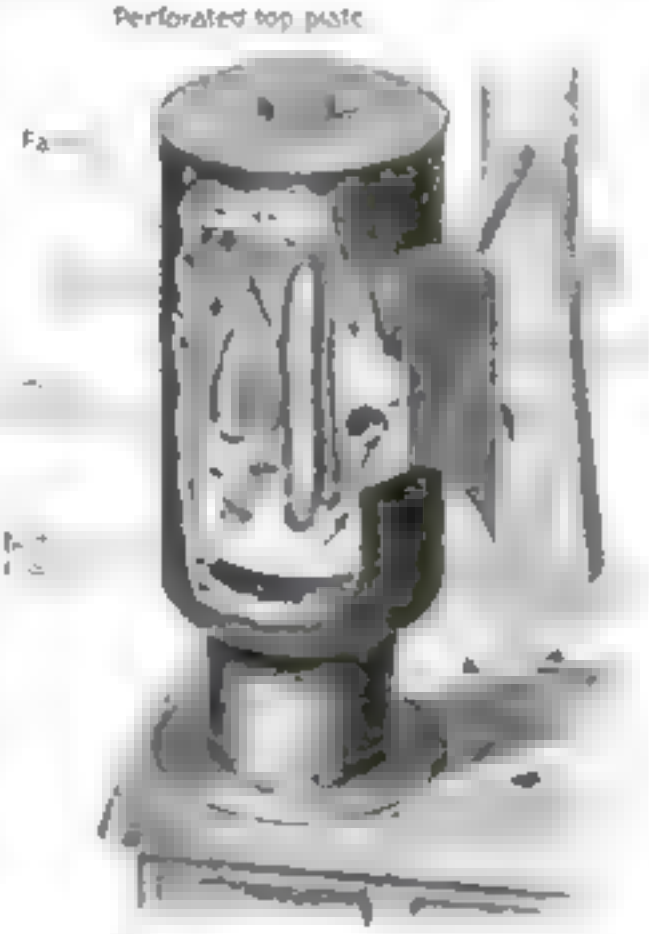
ONE of the essential duties of a soldier is to keep constant watch upon the movements of the enemy. High trees and tall buildings are, naturally, the most suitable places for the establishment of observation posts and are given preference wherever they are available. The tree in the picture, which may still be standing somewhere near Dixmude, was used by the French soldiers, perching securely among its top branches, as observation post to good advantage. The tree, a magnificent specimen, tall and of generous girth, made it possible for the French observer to get a fine view of the German lines. A ladder gave access to the observation post. Even a small crib was arranged near the top, where one of the observers could sleep, while his comrade kept watch.

A French soldier is on observation duty way up in the tree-top

Smoke Your Own Hams with This Portable Smoke-House

THE German *hausfrau* has her own smoke-house which she uses in connection with the domestic stove. It is practically a large sheet-iron can, with a neck at the bottom of suitable width to fit the stove. Inside it is divided into two compartments. A partition is placed on one side which connects at the top with a perforated plate (wire gauze would probably do), and at the bottom with a solid plate forming the bottom of the chamber.

The smoke passes up through the connecting pipe, up the back passage, down through the perforated plate into the smoke-chamber, and thence through the outlet into the chimney. Any dirt or soot or cinders are intercepted by the perforated plate. The apparatus is used on the kitchen stove, with a small, slow-burning fire and any suitable smoke-producing material that is at hand.



This smoke-house is used on the kitchen above with a small fire

Just the Thing for a Kitchenette —An Electric Cooker

HOUSEKEEPING in a modern apartment, although its space economy is carried to extremes, can be simplified by the use of the portable cooking box invented by Mr. Leoline Edwards, of Twickenham, England. It is essentially an improved "fireless cooker" of simple construction, in which the heat necessary for cooking, baking, boiling or broiling is supplied by an ordinary incandescent electric lamp.

The cooker is eighteen inches high and twenty inches square and weighs thirty pounds. It consists of two iron cases, one inside of the other, but separated by a thick filling of expanded cork. Through a hole in the lower part of the box the socket of an electric lamp is passed, which may be connected with any convenient plug or lighting fixture. To the socket an ordinary electric light bulb is attached inside the box. Above the heating bulb several shelves are arranged, so that several dishes may be cooked at the same time. The cooking box may be opened by the housewife at any time for the inspection of the contents, which cannot be done with the ordinary "fireless cooker," for the lamp will soon replace any lost heat.

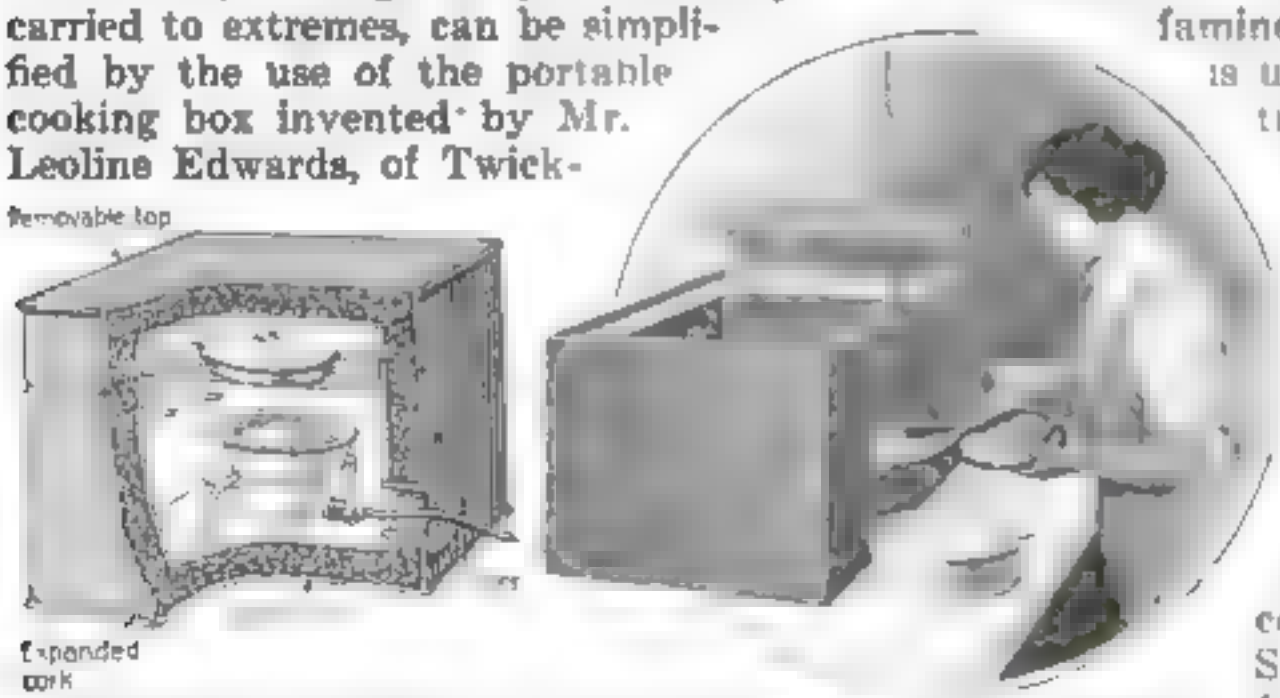
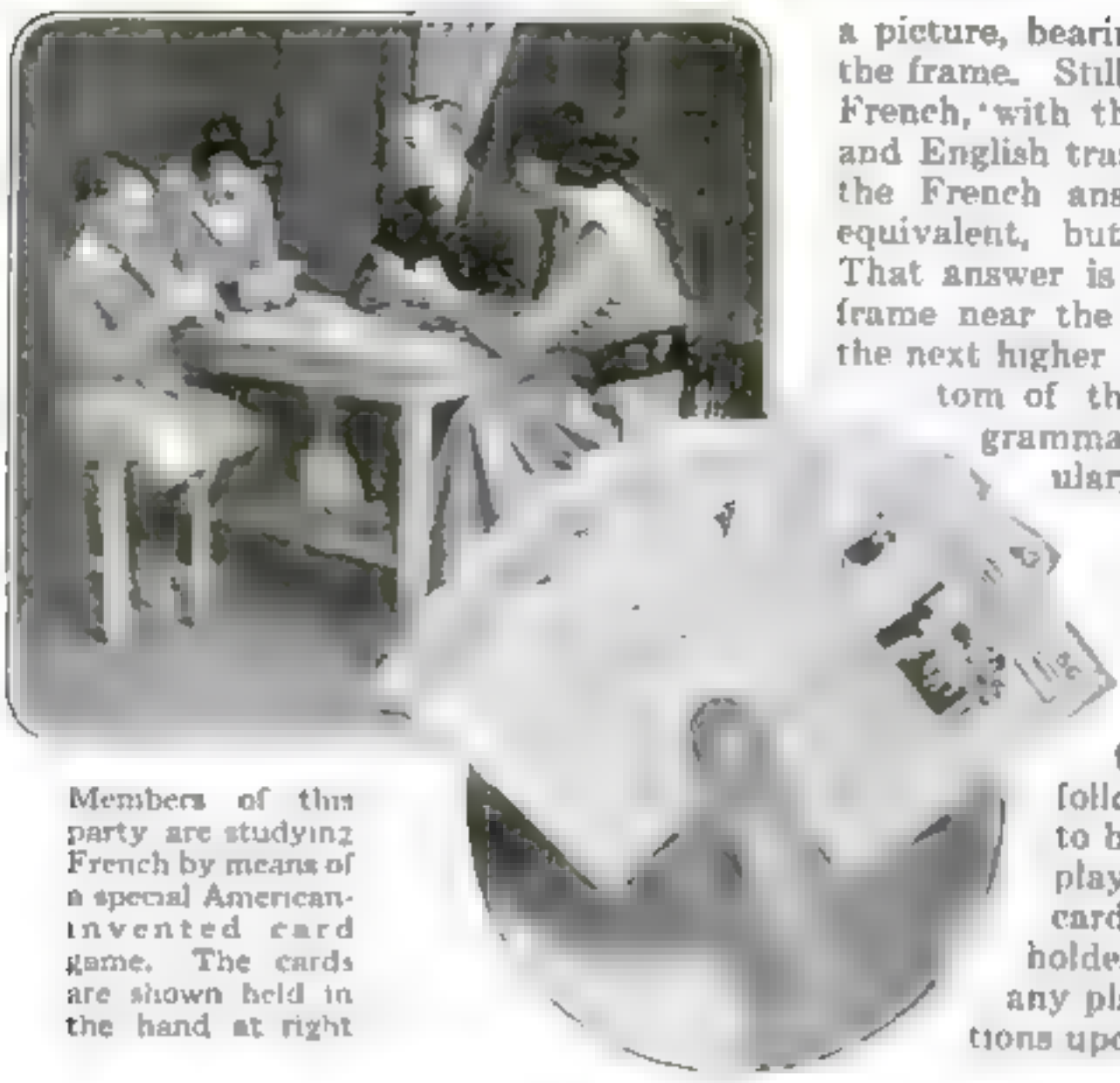


Diagram and method of use of a homemade electric cooker
It is a kind of improved "fireless cooker," simply constructed

Pity the Salt Industry: It Makes Little Profit

A RECENT investigation by the Bureau of Mines proved that a salt famine in the United States is unlikely. At the same time it was established that owing to the low price of salt and the abundance of its supply there is but little profit in the salt industry, although the American salt works have supplied in recent years practically all the salt consumed in the United States. What a pity—for the profiteers—salt is not used in munitions!



Members of this party are studying French by means of a special American-invented card game. The cards are shown held in the hand at right

a picture, bearing upon the answer in the frame. Still lower is a question in French, with the phonetic equivalent and English translation, together with the French answer and its phonetic equivalent, but without translation. That answer is repeated within the frame near the top of the card with the next higher number. At the bottom of the card there is some grammar comment and vocabulary and so forth.

Number One reads the question on his card; Number Two reads the answer as given on his card, with its English translation, and in turn, follows with the question to be answered by the next player, and so on until the cards are exhausted. The holder of the joker can ask any player one of the questions upon his card.

Parlez-vous Francais? If Not, Learn How with Playing-Cards

AN ingenious American inventor has recently put on the market a card game invented by him, which is designed to teach French, or at least the rudiments of the language, by means of a game played with a special pack of sixty-one cards.

The cards are numbered from 1 to 60 and in addition there is a "joker." Each card has printed upon its face a top line giving some French word or phrase, with its phonetic equivalent and an English translation. Under that, in a frame is, in French, the answer to a question printed on the card with the next lower number. Under that is

A future story "When Mama hung me out on the line to dry"

They Hung Little Jessie on the Clothesline to Dry

THE little girl on the clothesline is not a victim of Boche atrocity, as some might imagine. She is a little American girl, and the condition of suspense in which she finds herself is merely the result of a happy inspiration. It was wash-day and the mother was extremely busy. The little girl also had been busy around the tubs and being a trifle unsteady upon her tiny feet, she fell into one of the tubs which, luckily, was filled with cold water.

The mother was too busy to change the child's clothing and so she fastened the little toddler to the clothesline by means of her dress and some clothespins.

Trapping Salmon in the Far North

The people of the North spear thousands of salmon in dammed streams

By Christian Leden

The salmon are caught in stone traps after which they can be speared with the Eskimo Kakimaks or three pronged forks. The Eskimos catch thousands of fish in this way

AMONG many Eskimo tribes, salmon fishing is one of the most important means of existence. The natives along the West Coast of Hudson Bay fish for salmon the year around, only varying their methods to suit the changing seasons.

In the Summer, the salmon in the ocean, just beyond the rivers, are caught in primitive nets. During the Autumn when the salmon leaves the salt water the Eskimo builds several stone walls across a river, leaving one stone out in each division, except in the wall highest up. This leaves a free passageway for the salmon as it goes up the river with the incoming tide. When the tide turns, the Eskimos close the openings in the lower walls, and at the ebb, they wade out into these small compartments and spear the trapped salmon with their Kakimaks or salmon-spears. This slaughter of salmon takes many days. They get many hundreds—sometimes thousands—of salmon in one river.

Later in the Winter, when the ice has formed on the lakes, holes are cut in the ice through which to angle for the salmon. This is done by attracting the salmon with a little piece of walrus ivory carved to look like a fish. The decoy is kept moving by the help of a line of deerskin sinew. When the salmon approaches to examine the little imitation fish, he is speared with the Kakimak that the Eskimo holds in his right hand.

In Spring, when the poor salmon gets rather hungry, it is easily caught with a bait and fishhook. Then, even the women go out and angle for the harassed fish, through the holes in the ice. It is fortunate for the inhabitants of that inhospitable region that salmon are plentiful there at all times, at least sufficiently so for the simple wants of the Eskimos, otherwise times would be very hard.

Those of us interested in science, engineering, invention form a kind of guild. We should help one another. The editor of the POPULAR SCIENCE MONTHLY is willing to answer questions.

Three Automobile Bodies in One

Here is a car body that can be changed on the road to any of three styles

The Body in Process of Transition and in Use as a Runabout

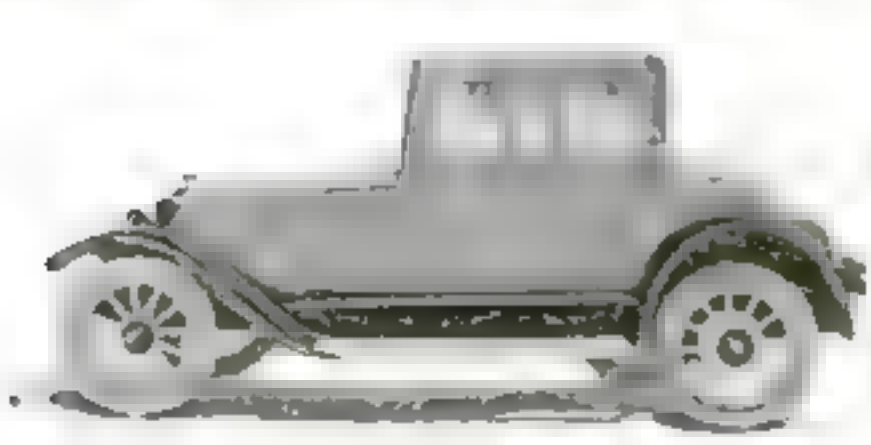
The changes are made by the use of a folding and sliding superstructure. When the car is used as a runabout this is slid back and swung down on a hinge into the rear seat portion of the tonneau. To change to a landaulet the superstructure is raised to a vertical position and side panels are opened out from the front portion of the body to enclose the sides. The coupé is made by sliding the entire top forward in slots that are provided in the sides and swinging up a rear deck from under the rear seat to fill up the space left

"WHICH automobile do you like best?" Ask a woman and she will name the one with the body that most appeals to her. Ask a man and he too will express his taste in terms of the body. For the body is the most exposed part of the car; it expresses a car's individuality. As a result, there is a greater and greater demand for bodies of distinction or for those which have some particular feature that the greater number lack.

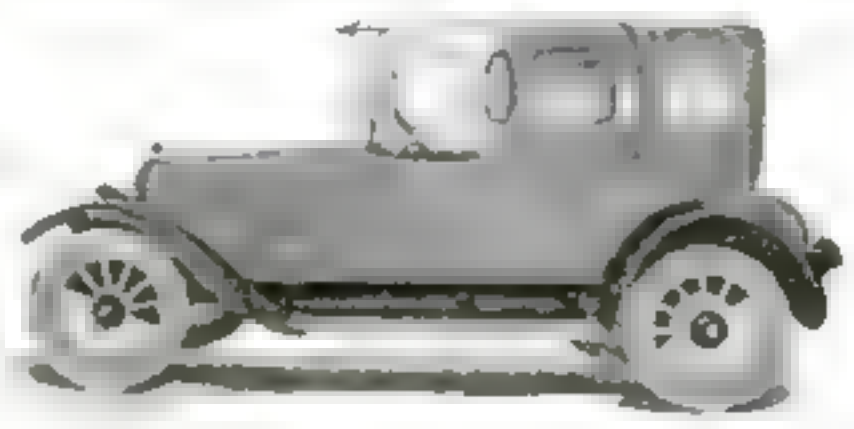
With the demand for better looks in automobile bodies has come an equal demand for greater comforts as expressed by convertible bodies which can be thrown open to the gentle breezes in the balmy spring days or closed and heated in the bleak winter months. One of the most ingenious automobile bodies designed to fulfill these conditions of individuality and comfort is that shown in the accompanying illustrations. It is really three bodies in one, for it enables the car to be changed in a few minutes into a runabout, a landaulet with the driver outside and the passengers in their own compartment, or a coupé with the driver and the passenger on one enclosed crosswise seat. These transformations may be made on the road at any time and without the addition or removal of any parts, whereas in the early days of body design, such transformations would have necessitated the employment of three separate chasses, each with its own particular body.

The metamorphosis is accomplished by using a sliding and folding superstructure. This can be folded down and concealed, or raised and used in either of two positions, thus forming three distinct types of car.

The advantages of such a body as this are obvious. One has a universal car, suitable for all occasions, and all weathers.



This is the convertible body as it appears when it is used as a coupé



Showing how body is changed from coupé to landaulet by sliding top back

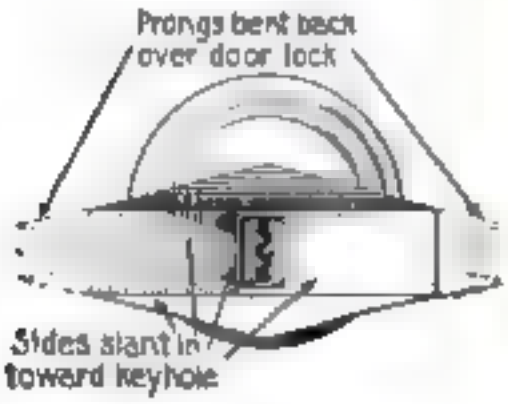
The Very High Cost of Writing Letters

HAVE you ever figured out the cost per letter of your business correspondence? Taking into consideration the cost of stationery and stamps, the salary of the stenographer, cost of all accessories to the typewriter, all overhead charges, and last, but not least, cost of time of the man who dictates the letters, it works out at forty cents per letter, and that is an absolute minimum!

Why this formidable-looking array of pipes? Just in order to separate natural gas from oil

That Elusive Keyhole Simply Must Be Found

THERE are times in the life of most jolly good fellows when they find it quite difficult to find the exact geographical location of that narrowly circumscribed opening into which their latch key is supposed to fit. But even persons not included in the class of good sports often have difficulty to find the keyhole, particularly at night or in cases where the door is located in a dark hall or corridor. The key hole guide invented and patented by Ernest E. Brown of Waukegan, Ill., is designed to give relief in all cases where the finding of the keyhole is, for any reason, connected with difficulties. These guides, which form a kind of trough with sides slanting toward the keyhole, are hammered into place over the regular doorplate, and conduct the key unerringly to the keyhole with absolutely no effort at all.



Showing construction and application of the handy keyhole trough herein described

Oil and Gas Mix, and So They Are Separated Out West

MANY oil wells yield both oil and gas so, with such a plant as is shown, the flow is forced directly from the well into a large main pipe. The gas separates from the oil and rises to the top of the pipe, passing over through the small inverted U-shaped pipes and into the smaller main.

For many years natural gas in oil wells was considered a nuisance and was allowed to waste, but now, on account of its fine heating, fuel and power qualities, large investments are made to conserve and utilize it. The day of the picturesque burning gas well, lighting the country at night for miles around as an advertisement of a natural gas region, is practically a thing of the past. Such a spectacle is rarely seen now and when it does occur it is looked upon as an example of poor engineering

Natural gas is, nowadays, a valuable commercial commodity, and a number of cities use it exclusively in lieu of coal gas for heating, lighting, and power purposes. It is, of course, much cheaper than coal gas.

Making Animals Transparent

We used, as children, to read about invisible cloaks. Read how a rat got his "cloak"

H G. WELLS once wrote a striking story about an invisible man, who owed his invisibility to the fact that a method had been discovered of rendering the refractive index of his body to light exactly the same as that of the atmosphere. In other words, his body became absolutely transparent and hence invisible.

Perhaps the principle may be better understood if we consider the case of a glass tube. Ordinarily the tube reflects lights and objects. Placed in water, the tube becomes much more transparent; but placed in a liquid having the same index of refraction as the material of the glass, the tube is hardly visible at all. On the other hand, "ground glass" is opaque because the rays of light are bent; the surface of the glass is so broken up that the separate rays of light do not pass through in a direct line at all.

That Wells was not merely romancing is strikingly demonstrated by the accompanying photographs which were made for the POPULAR SCIENCE MONTHLY with the consent of Doctor Harmer of the British Museum. The trustees of the Museum applied to the proper British authorities for permission to use the discovery disclosed in a German patent granted to Hermann Streller of Leipsic. Streller actually patented what appears to be a valuable process "for rendering organic and inorganic bodies transparent and translucent" by juggling the refraction of light in the way proposed by H. G. Wells in his story.

The rat that Doctor Harmer treated passed through more than one solution before he was reduced to comparative transparency. First of all the rat was stripped of his fur overcoat. Reduced to stark nakedness, he passed through solution after solution. Like all other animals, a rat consists largely of water. This was removed and he was immersed in weak alcohol. Gradually the alcohol was strengthened until the water was all expelled, and the rat was practically pure alcohol. Then a fluid was intro-

This rat has been rendered partially invisible by the chemical treatment of his body

Here are three objects—opaque, semi-transparent, and transparent. Note the rat's bones

duced which mixed equally with alcohol and with oils. Eventually the rat was converted into pure benzol in order to get rid of the alcohol. At any given stage he was filled with some liquid to prevent him from collapsing. Finally an air pump was used. He passed through a vacuum into the liquid with the same index of refraction as his own. The vessel containing the liquid was then sealed.

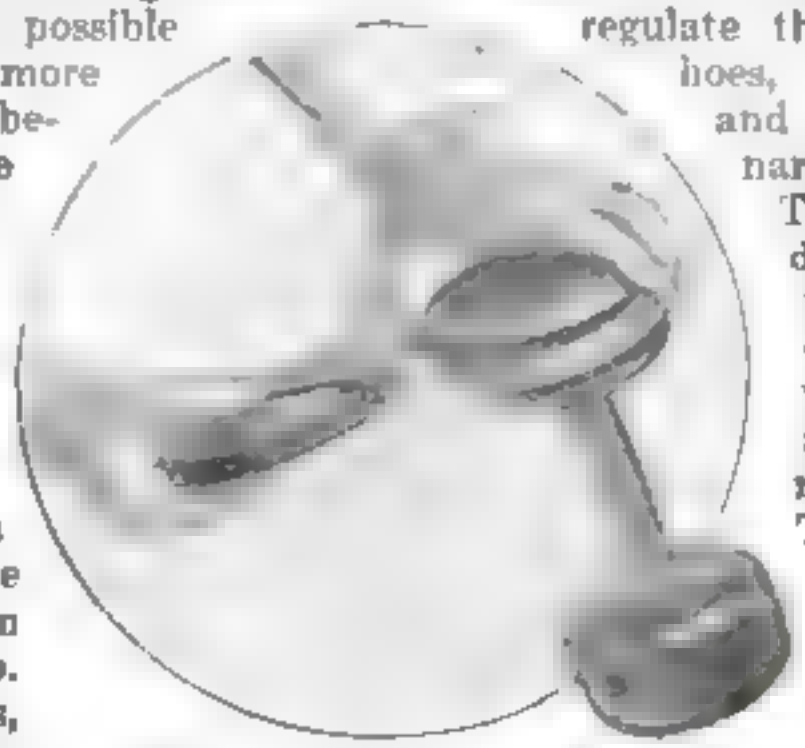
It is of course impossible to obtain absolute transparency. The different parts of an animal's body have different indices of refraction. But it is possible to make certain groups of muscles disappear if their index of refraction is known. A mixture of three parts of salicylic methyl ester and one part of benzyl-benzoate is a liquid which has an index of refraction corresponding with that of most animal tissues. According to Professor Spalteholz, human bone can be revealed by using five parts of oil of wintergreen and three of benzyl-benzoate.

A new hoeing machine which imitates well the strokes of the human arm

The Weight of This Dumbbell Can Be Changed

FEELING particularly strong and vigorous this morning?—Add another pound or two to each of your dumbbells. You can easily and quickly do that if you own a set of the variable weight dumbbells recently invented. As may be seen in the diagram, each end weight is rounded and attached to the handle section by a long machine bolt with counter-sunk head. By unscrewing the head sufficiently it is made possible to insert one, two or more extra weight-disks between each end piece and the handle section. The extra weights are slotted so that they may be slipped into place without entirely removing the end-piece and screw bolt. After the bolt screw has been tightened the curved flange holds them so that they cannot slip.

Now all you athletes, go ahead and rival Sandow.



This dumbbell can be adjusted to suit the "pep" of the user

It Does the Work of Four Men—This Hoeing Machine

A HOEING machine, invented by Otto F. Ullman of Severy, Kansas, operates several hoe-blades simultaneously. It does the work of three or four men armed with hand-hoes. Only one man operates the machine.

The hoe-blades are fixed to the lower ends of arms suspended from a crank-shaft. Bars extending from the hoe arms to rocker arms at the rear of the machine regulate the movement of the hoes, imitating the strokes and motions of an ordinary hoe worked by hand. The crank-shaft that drives the hoe-blades is connected by a chain, sprocket-wheels, a gear-shaft and gears with the main or driving axle. The device may also be arranged to be driven by power from a small gasoline engine, but it is not very hard to run by hand.

Housekeeping Made Easy

A mahogany chiffonier having one drawer made into a handy writing desk

A portable electric nitrogen bulb radiator made in the form of a steam or hot water radiator

Requiring practically no effort in operation, this sweeper collects all crumbs when pushed over the table-cloth

Cleverly designed cigarette box shown above

Five ash trays in holder for the smoker's private den

An immersion electric heater which cannot burn out is shown at the left in use in a tumbler

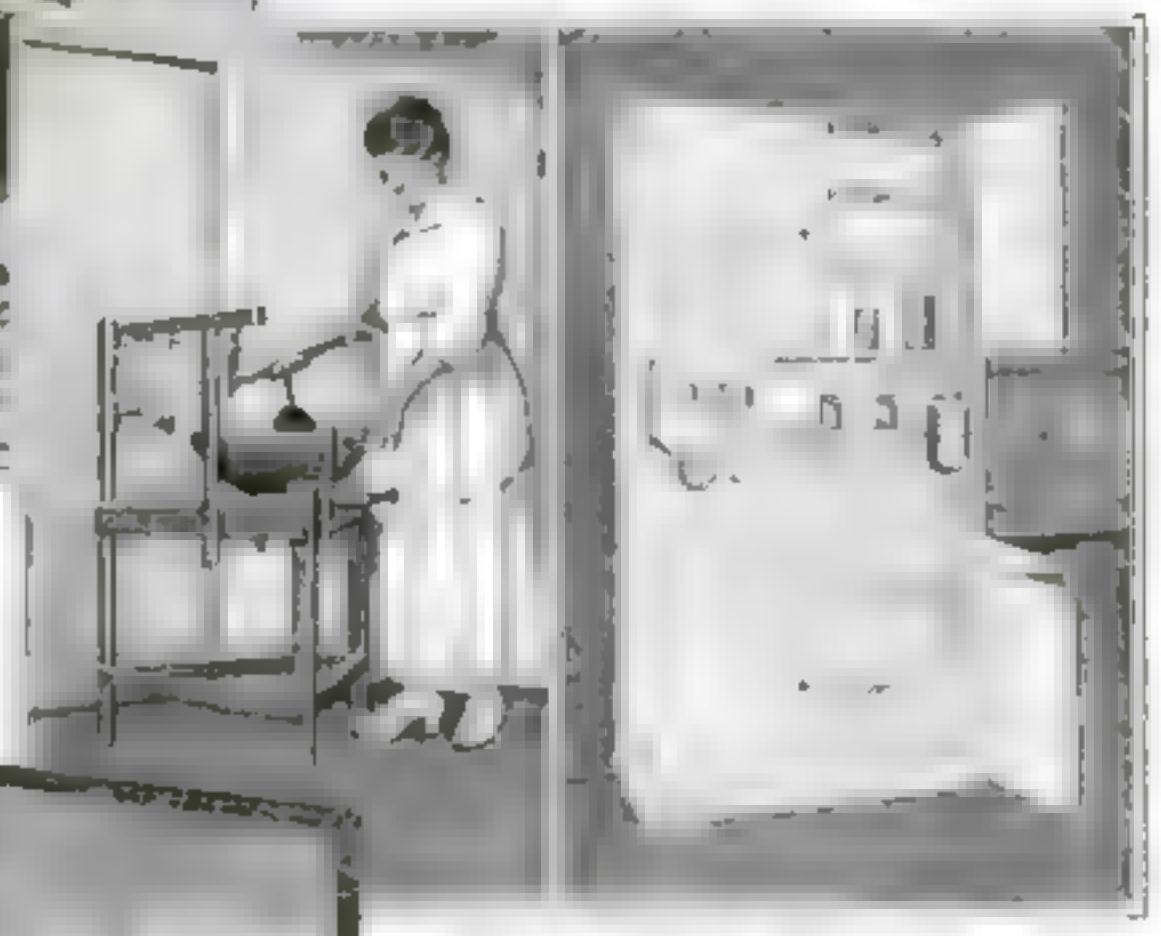
The utensil shown at the right is made of porous material and serves as a refrigerator by the evaporation of water through the sides

The book rest shown below makes reading in bed more pleasant

Housekeeping Made Easy

This suction cleaner is mounted on large casters with ball bearings and rubber tires for moving it about easily from room to room

Attractive molds for making the mud pies which are so much enjoyed by most youngsters

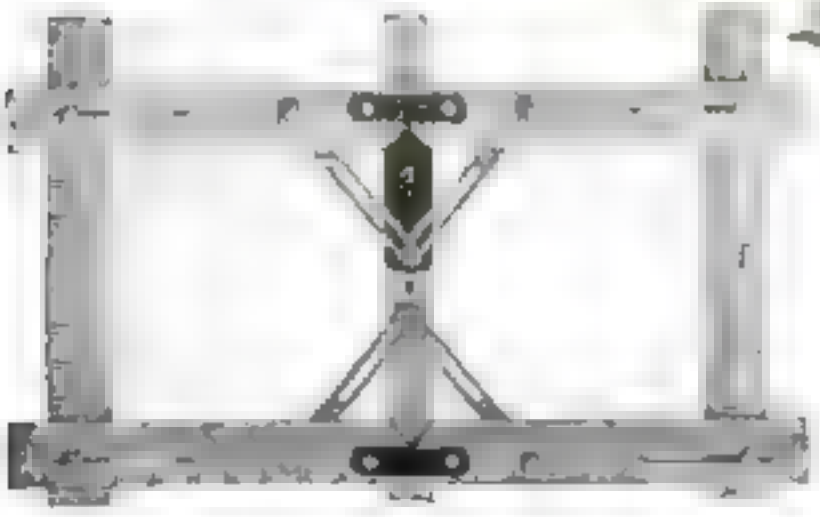


The delivery of china is made much more efficiently and with less damage by the use of a special padded trunk shown at right

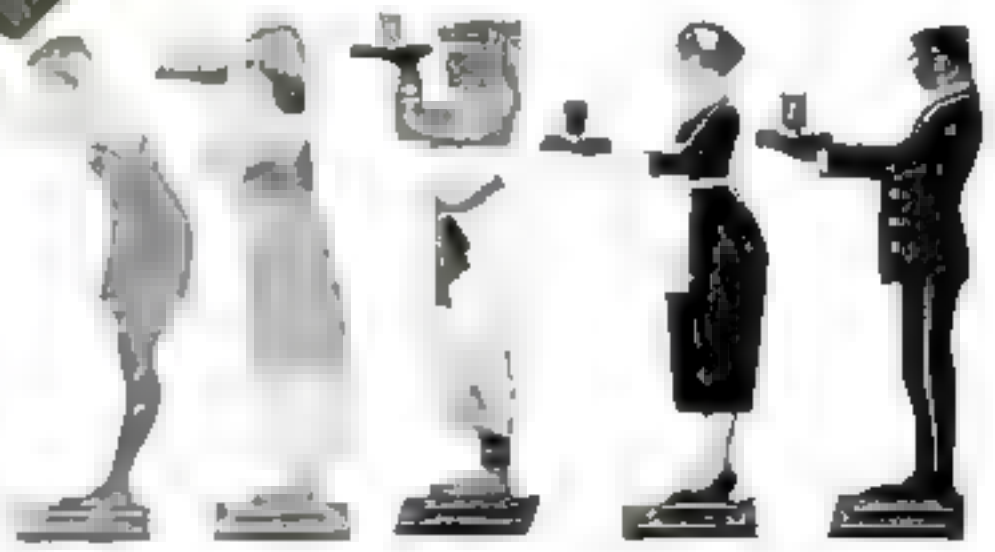
Butter making on a small scale is tiresome but this machine greatly lessens the unpleasantness

There is nothing quite so enhancing to the kitchen as a handy cabinet nicely enameled white

A curtain stretcher frame is shown below which has an attached easel to hold it instead of standing the frame against the wall



Different types of stands for smokers, which are three feet high and finished in natural colors



This trick bottle is made especially to "soak" movie actors over the head

The Bottle Breaks, But Not the Head of the Villain

BREATHLESSLY the spectators are watching the bewilderingly rapid development of the drama on the screen. The hero, singlehanded, defies the villain and his henchmen, while the heroine, whom he protects, is hiding her face. Neither she nor the hero notices the sneaky "Greaser," who, armed with a big whisky bottle stealthily approaches the hero from behind.

The descending bottle breaks into bits over the head of the hero, who drops in his tracks.

But, do not fear; the bottle was actually broken, but the hero remained unscathed. The Mexican's deadly weapon was one of the recently invented "break-away" bottles.

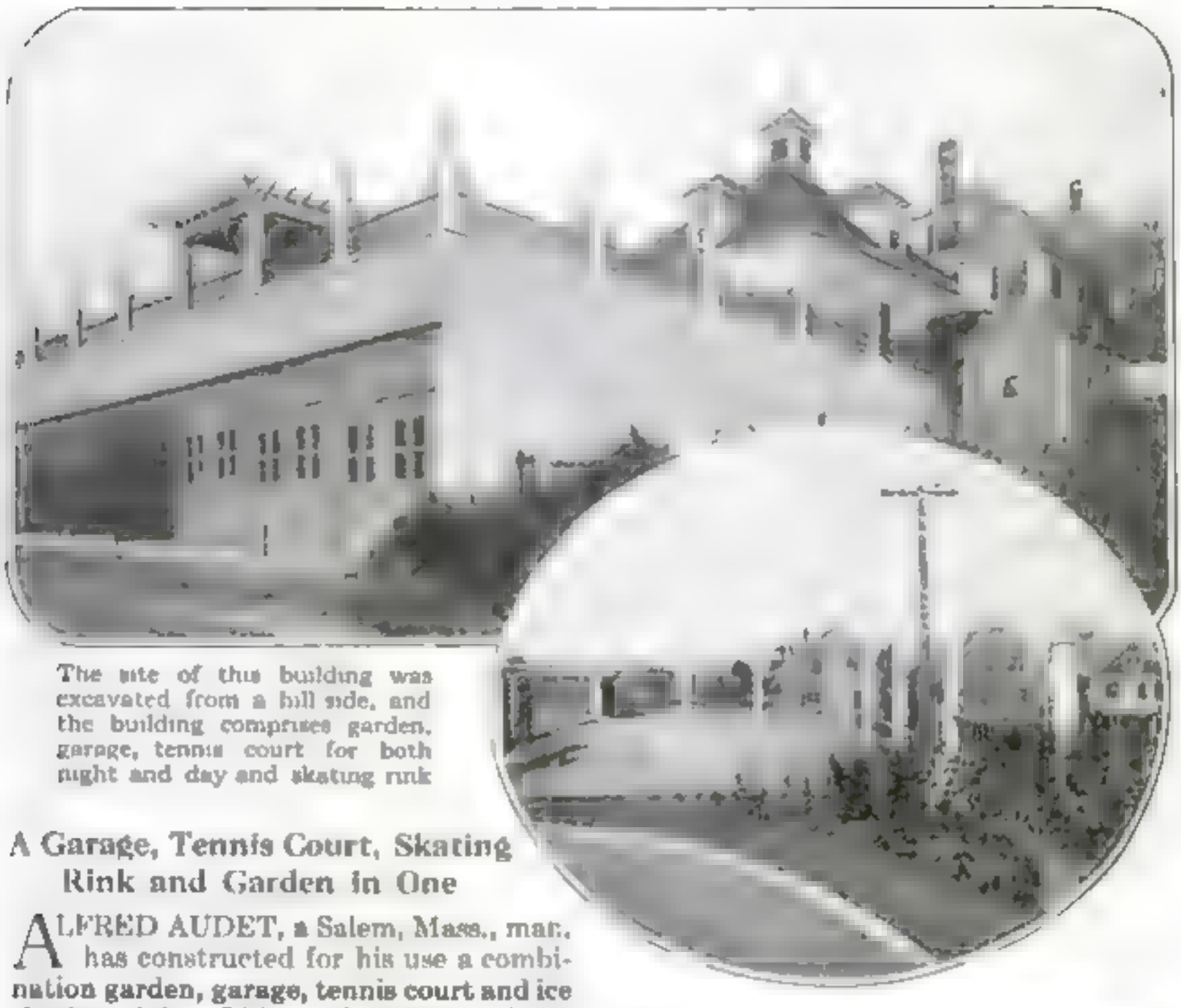
For a long time artisans in the motion-picture industry have tried to devise a transparent "break-away" bottle, that is, a bottle which would have all the properties of glass except that it would not cut or scratch. Until recently the bottles used were made of an opaque substance which would shatter readily, but which was not transparent. The problem has at last been solved in the modeling department of the Balboa studio in California. William Dummer, chief of that department, has invented such a bottle. The material from which it is made, a combination of ether, gelatine, resin and oil, will crack and break like glass, but it will not cut and may be shattered over the head of the hero without in the least marring his manly beauty. And, what is equally important, it is transparent.

This Pocket Drinking-Cup Folds Up Like a Purse

AS a matter of sanitary precaution every man, woman and child should carry an individual drinking cup. The health authorities have long recognized the importance of permanently banishing the unhygienic and disgusting public drinking cups and have strongly urged everyone to carry his own cup.

This cup is made of aluminum and oiled silk and can be folded up flat

One of the difficulties in the way of carrying out this reform was the lack of drinking cups that would fill the requirements of hygiene and be so fashioned that they could easily be carried in the pocket. The cup shown in the picture consists of two aluminum plates, connected by a strip of oiled silk folded in bellows fashion. The edges of the aluminum plates are folded over the edge of the silk and crimped tightly.



The site of this building was excavated from a hill side, and the building comprises garden, garage, tennis court for both night and day and skating rink

A Garage, Tennis Court, Skating Rink and Garden in One

ALFRED AUDET, a Salem, Mass., man, has constructed for his use a combination garden, garage, tennis court and ice skating rink. This roof garden is built into the side of a hill in the rear of the dwelling. The hill was apparently a barrier to further development of the property, but it was eventually an advantage. The garage space is hollowed out of the hill. The garage measures thirty-eight by seventy-seven feet and comprises six separate houses to accommodate three cars each. Every compartment is thirteen by thirty-eight feet, with electric lights and hot water heating.

The dirt taken from the hill was placed on the roof of the garage for the tennis court and garden. Electric lights permit play at night. A wire netting thirteen feet high set in the large cement posts prevents balls from landing in the street below.

Besides the tennis court there is a spacious garden which makes a veritable bower of beauty. A pergola thirteen feet square and lighted by electricity is a feature of the garden.

The roof of the garage and the base of the tennis court and garden are of cement, ten inches thick. The whole makes a novelty in construction that is a delight to the many suburbanites who have seen it.

Utilizing the Waste Heat from a Gas-Engine

FOR a long time the waste steam from steam-engines has been turned to good account, but there have been difficulties in the way of using the exhaust gases from a gas-engine as they readily attack the metal of the conduits. However, the difficulty is being overcome, for a New Jersey candy factory has an installation in connection with a sixty horse-power engine which is used to heat the factory. The gases pass through an economizer made of cast-iron, with the passages to the different sections staggered so that all parts are heated for the whole length. Water circulates in jackets surrounding the gas passages.

Enjoy Your Snapshots Better by Enlarging Them

IF you are an amateur photographer with a hand camera for making only small pictures it will add a great deal to your enjoyment of them if you can enlarge them or, still simpler, look at them with an enlarging contrivance like that shown in the picture. The device is merely a five-inch concave-ground mirror set upright in such a manner that it reflects the picture facing it.

This concave mirror enlarger gives "depth" to your snapshots without trouble or expense

The frame of the mirror is hinged to a board, which forms the base of the device when it is in use. Three slots, for obtaining three degrees of enlargement, are provided in the base and hold the picture to be enlarged. No focusing or adjusting is necessary.

Looking at snapshots with a lens is always interesting for it gives them "depth" and perspective. The camera being a one-eyed instrument, the photographs lack this in the ordinary way. The lens-mirror remedies this. Frame and case are covered with black leatherette, and the whole device folds up to a package one inch in thickness and six inches square. Amateur photographers who have used this contrivance have found it a valued part of their equipment.

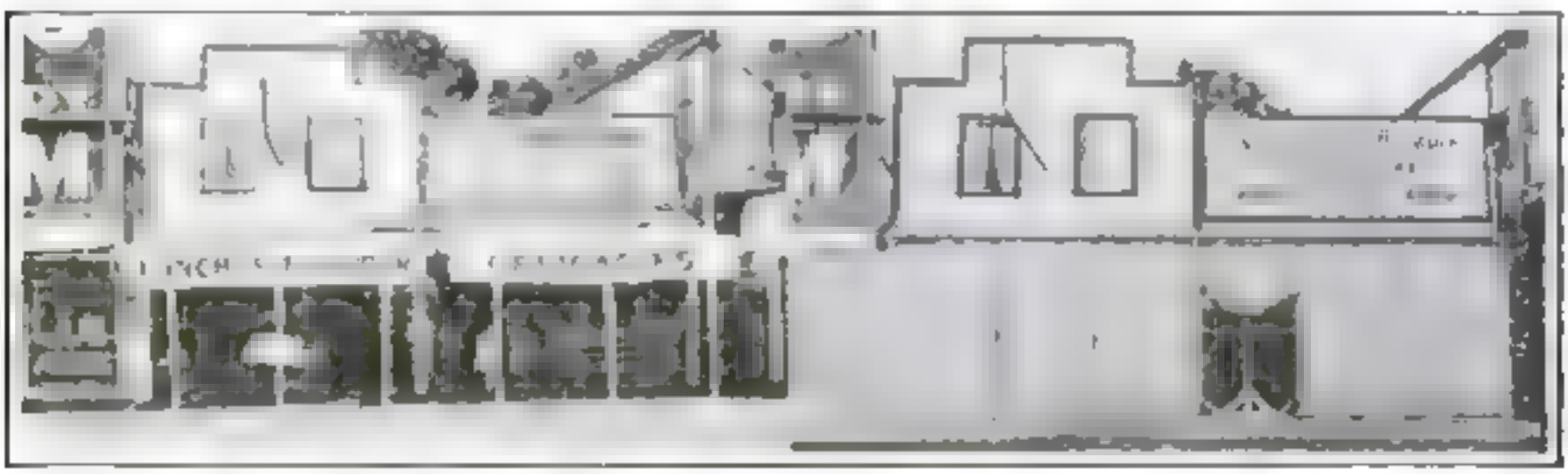
Grocery Store Has Combination Front and Awning

WHEN William Judd built his grocery store at Avalon, Santa Catalina Island, he had to have a front to the place, and he also needed an awning. So, instead of going to the expense of providing both, he combined the two.

Mr. Judd considered that he didn't need an awning when his store was closed, and when it was open he didn't need a front. So he set to work and built a rather substantial awning on a frame that works on hinges attached to the building. The awning is provided with hinged legs swung to the lower edge, which fold upward when it is lowered.

At the end of the day it is only necessary to fold up the legs, lower the awning, and lock it. When time to open the store in the morning, the front is unlocked, and raised into place to serve as an awning.

This arrangement is very neat and very convenient, but it appears to be only suitable for mild climates, and among strictly and universally honest communities, as its rather flimsy construction would not keep either weather or persons out for long. So Mr. Judd's novel grocery store front attests the confidence he has in Avalon folk.

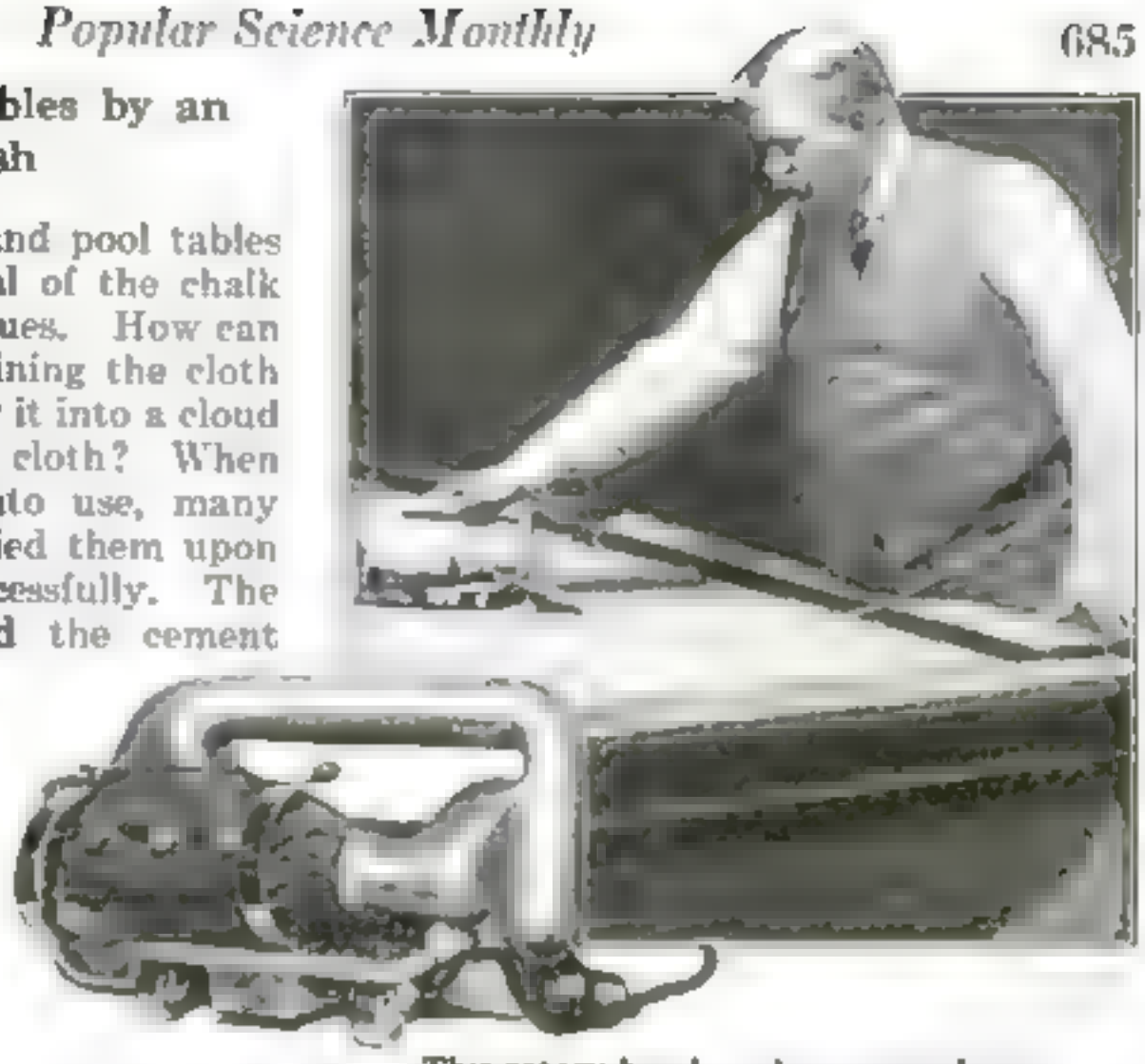


Here is the latest thing in grocery store fronts, well adapted to warm climates. When the store is open it is a very effective sun-awning, and when the store is closed it forms the front wall

Cleaning Billiard Tables by an Electric Brush

THE cloth of billiard and pool tables takes up a great deal of the chalk dust that drops from the cues. How can it be removed without ruining the cloth and without merely raising it into a cloud that settles again upon the cloth? When vacuum cleaners came into use, many owners of billiard halls tried them upon their tables, but unsuccessfully. The powerful suction loosened the cement between the slate plates forming the bed of the table and in a short time wore off the nap of the cloth.

An electric brush, which was invented by Mr. Dolph L. Lowery of Sandusky, O., avoids the undesirable features of the vacuum cleaner.



This rotary brush and vacuum cleaner cleans billiard tables without damage

The contrivance has the appearance of a large flatiron and moves on swiveled wheels over the cloth. A small electric motor furnishes the power for a rotary brush in the front part and a suction fan in the housing in the rear of the motor. Loosened by the bristles of the brush, the chalk dust is drawn through a tube to the center of the fan and blown into a bag connected with the fan housing. The excess air is allowed to pass out of the bag through strainers which hold back the dust.

As all billiard players know, it is absolutely essential that the surface of the table shall be perfectly true, and great difficulty has been hitherto experienced in cleaning the cloths, as even a soft brush is likely to raise the nap and cause an infinitely small unevenness, which, nevertheless, may upset the accuracy of the table to a noticeable degree.

A Pair of Socks Every Thirty-Five Minutes—Red Cross Knitters Please Notice

THE enormous demand for sweaters, scarfs, etc., for the American soldiers and sailors made it clear that this war work needed speeding up. So the Comforts Committee of the Navy League of the United States installed in its headquarters several knitting machines and turned them over to the women. Even the most expert knitter cannot knit much more than one pair of socks a day, while a machine like that shown in the picture, if skillfully operated, can turn out one pair of socks every thirty-five minutes.

Patriotic women are operating knitting machines to speed up the war work

The Richest Food in the World

Solving the food problem with the Soya Bean

By Hudson Maxim

Hudson Maxim is the inventor of smokeless powders used by the United States army and navy. He is America's foremost authority on high explosives. As a member of the Naval Consulting Board, he has given up much of his time to the consideration of war inventions. The food problem seems to him the most important of all, and here he suggests a method of using the Chinese soya bean in solving that problem.—Editor

IN my book, "Defenseless America," published three years ago, I called attention to the defenselessness of this country, but in that book I dealt mainly with our lack of preparation in respect of fighting men, fighting ships, and all the munitions and military equipment of war. All my conclusions in that book have been most emphatically verified by results since our entrance into the present war.

Hudson Maxim is now turning his attention from explosives to the study of foods

But there was one very important phase of our unpreparedness for war which I did not mention and that was the food problem. The provision and distribution of food has proved to be one of the main problems of the war, and the solution seems farther off than ever. Present tendencies indicate that the time is near when the production and proper disposition of food to our own people, to our Allies and armies over-seas will be the most baffling task which we shall have to accomplish.

The food problem is a three-in-one problem — first its growing, second its transportation, third its consumption.

There is enormous acreage in the United States, not at present profitably employed, which can be devoted to raising some of the most nourishing and valuable of foods, provided that the market price and means of transportation were such as to make the work profitable to the farmer. Throughout the South, especially, are large areas which have been abandoned because of the cotton boll-weevil. These areas could be very profitably employed in raising a great variety of foods not at present cultivated to the extent which they ought to be raised. Among these the principal is the Chinese soya bean, a food which is so rich in fat and protein as to outclass

Here we see the soya bean being handled in quantity in its native country. Note the peculiar topped baskets

the popular beefsteak in nutritive value.

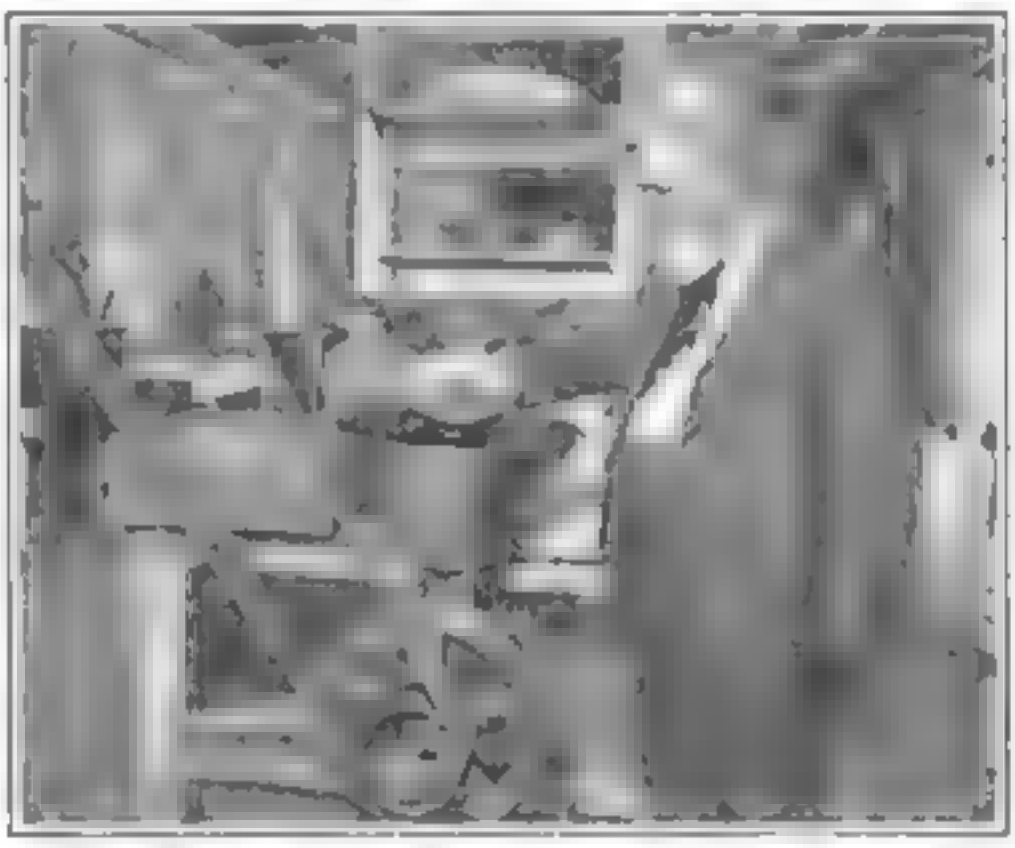
But the soya bean is unlike the common American product in that it requires special treatment in its preparation to make it suitable for human food. I have been studying the soya bean for several years and have succeeded in producing a soya bean product which I call So-Soya. This product is a food-conserver, because it is not only highly nutritious in itself, but because it adds nutritive value to food with which it may be mixed.

Thus it becomes possible to use many foods of low nutritive value and to give them the nutrition they lack by the addition of my products. When mixed with almost any other food in the world, it improves both its taste and nutritive value.

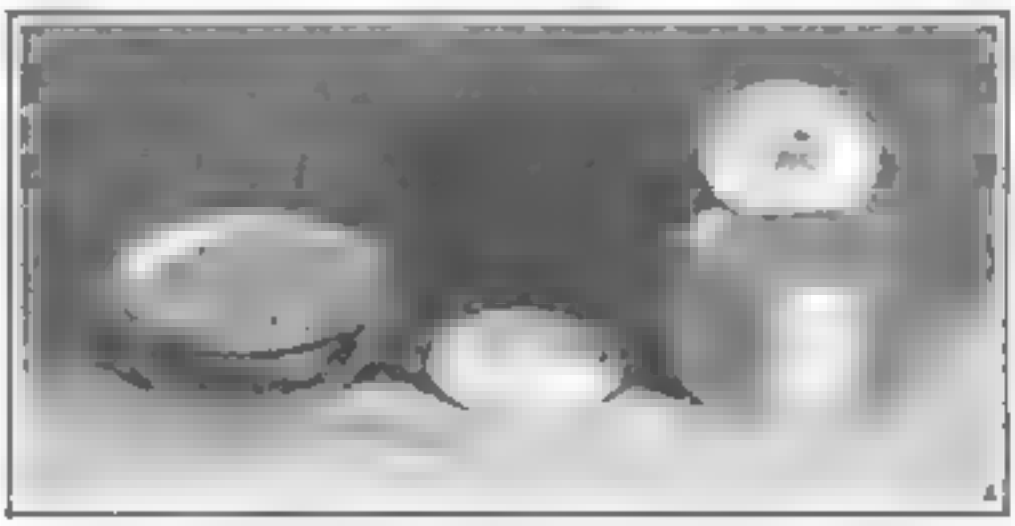
The food is prepared in the form of a very dense, stiff paste, somewhat resembling peanut butter in general appearance, but So-Soya being a complete food it is far more palatable in the pure state than peanut butter.

The following are some of the most important uses of this new food concentrate.

It may be eaten on bread, crackers or toast, or with potatoes, without any previous treatment. It makes excellent sandwiches. By mixing together equal parts cow's butter and So-Soya, the butter is doubled in quantity and for the purpose improved in taste.



The beans must be ground in producing the new food. Mr. Maxim is putting beans in the machine



Mr. Maxim believes that the soya bean products will eventually appear on every breakfast table

By merely adding hot water, So-Soya makes a delightful soup. Hot milk thickened with it makes one of the most delicious soups that could be desired. A plate of it makes a meal for most persons, such is its nutritive value.

Mixed with cold potatoes in the proportion of one part So-Soya to three parts potatoes and heated either with or without the addition of a little milk, a dish is made that is a decided improvement on the usual form of re-heated potatoes.

Used as a thickener for all kinds of gravies and meat sauces, it improves them. In all kinds of dressings for meat and fowl it serves as a most decided improver.

Ordinary round steak, chopped fine, mixed with So-Soya in the proportion of three parts of meat to one of So-Soya, thoroughly incorporated, and broiled like an ordinary steak, is at once both most delicious and tender.

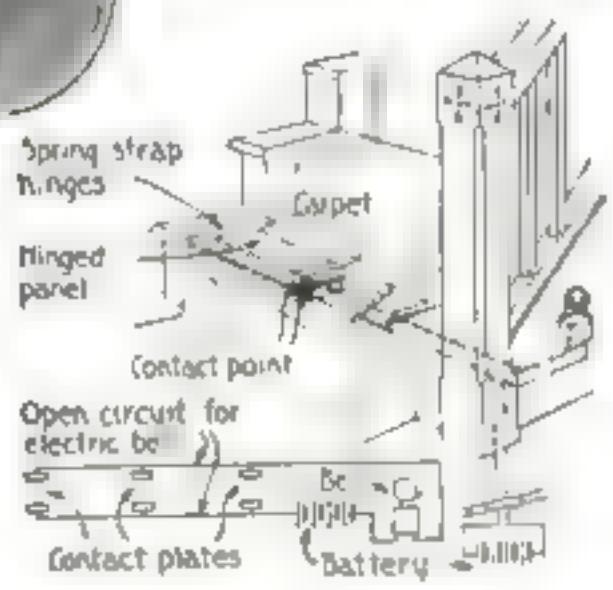
An ordinary beef shank stew, made by cooking the meat until it falls to pieces, then thickening it with So-Soya, makes a dish that has a flavor somewhat resembling terrapin.

Ordinary tripe, boiled until thoroughly done, with onions and butter added and cooked until the onions are done, and finally thickened with So-Soya, makes one of the best and most palatable dishes of all.

So-Soya is especially adapted as an all-round Army ration. There is no one thing on which the soldier can march longer and be sustained than on So-Soya, and there is no one thing that may be eaten more continuously with relish and without cloying the appetite than So-Soya. The reason for this is that it is a well-balanced food and one that partakes of the combined properties of vegetable, fruit and meat and is therefore satisfying.

Lest it be thought that I am trying to advertise So-Soya through the editorial pages of the POPULAR SCIENCE MONTHLY, I may state here that the product has not been put upon the market, and as yet I have taken no steps to that end. I have been negotiating with the Government in an attempt to get the Government to manufacture the food and supply it to the Army. For this purpoee I have offered the Government the free use of my inventions in foods during the war, if they will utilize them for any purpose they see fit.

The burglar commences warily to climb the stairs but he reckons not on the stair alarm



Just as he touches the fatal step the little burglar-alarm, which is shown here in detail, operates

The Burglar Makes a False Step

THE night is dark and cold. Someone is stealthily moving in the shadow of a residence. When the policeman, patrolling the beat disappears around the corner, a man, with his face muffled, slinks up to a house. "What a snap!" he murmurs.

Drawing a few skeleton keys from his pocket, he begins operations upon the inner door. The lock, a plain one, yields in a few moments. He enters the pleasantly heated hall. He knows his ground, knows where the stairway is that leads to the second floor, knows how to get to the room on the second floor where the family jewels may be found.

Softly he feels his way to the stairs. There is the first step. He raises his foot and plants it upon the first step. In a moment the scene is changed as by magic.

Stairs and hall are illuminated by a flood of electric light and—"Curse it!" snaps the startled burglar, as he hears the resounding din of a big electric alarm bell, loud enough to awaken everyone in the house, "that means git in a hurry or they'll nab me!" He turns and quickly makes his exit without standing upon the ceremony or order of doing it.

It was his first step on the stairs which had caused all this trouble. He knew where the stairs were but he did not know that the first step was hinged on a spring hinge so as to break an electric circuit while the step was not in use, and closing the circuit by the weight of a person pressing the three contact points of the movable part of the step against the corresponding contact points of the base underneath. The electric current thus put into action automatically switched on the lights and sounded the alarm gong, informing the whole household of his undesired presence.

Dummy Ships That Fooled the Germans

Their "sucide fleet" of imitation dreadnoughts a huge joke

Because of their utter helplessness in the event of attack, the British naval officers who knew of this wooden hoax referred to the fleet as "The British Suicide Squadron"

THE sinking of two wooden 'dreadnoughts' by Great Britain, some days ago, to form a breakwater, brings up more evidence of what disposition is being made of the dummy fleet of fourteen battleships with which Great Britain fooled Germany for some fifteen months during the earlier part of the war.

This titanic war jest, which was recently exposed by Lieutenant Henry Clay Foster, with the consent of the British Admiralty, completely deceived not only the Germans, but the English people themselves. No one in England was able to explain *how* the Germans could claim to have sunk the *Agamemnon* at the Dardanelles, when the Admiralty had admitted, officially, the sinking of only the *Goliath* and "some supply ships."

Germany rejoiced over this supposed sinking of the *Agamemnon*. But they must have wondered why the turrets and "guns" of the sunken dreadnought floated, for days, in the Dardanelles.

Lieutenant Foster states that the dummy battleships were converted from old third-class passenger ships of the Canadian Pacific Steamship Company, which were enrolled in the English Navy.

In an Irish port, says Lieutenant Foster, the dummy battleships were painted in exactly the same hue as the vessels of which they were counterfeits. Canvas was stretched over the decks and painted gray, and the upper decks and equipments finished in every detail to resemble the Grand Fleet ships so that any foreign aviator—or any British one, for that matter—flying overhead, would never suspect he was looking down upon any other than a member of the Grand Fleet.

Turrets and guns were all made of wood, with a careful exactitude in their outer color and finish. There was nothing real about the ships, so far as war purposes were concerned, except the brass trimmings, which were kept shining, as on a battleship, and some lifeboats, in which the crew were required to drill. The ships had neither speed nor defenses. Not one carried a real gun.

Jumping Through an Aerial Bonfire

One of the most sensational episodes of the great war

By Carl Dienstbach

THE great war has led to many radical changes in the methods of warfare. Some were discontinued altogether, others modified, still others greatly developed. The trench-warfare, which reached a higher development than ever before, naturally influenced the artillery tactics and led to an extensive use of observation balloons. These balloons, which were and still are used on all fronts, are essential for directing the fire of the artillery and have amply demonstrated their usefulness. The destruction of the enemy's balloons is one of the most important tasks devolving upon the aviation branch of every army. It might be said that it is part of their daily routine to seek and, if possible destroy, by gunfire or aerial bombs, the observation balloons which direct or correct the fire of the enemy's artillery.

Collision was inevitable. The airplane dashed clear through the burning balloon

It was one of those attempts to destroy an enemy observation balloon on the Italian front which led to one of the most sensational episodes recorded during the great war. One of the allied flyers, having ignited the gas of the hostile balloon, dashed with terrific force through the fiercely blazing bag and, although disabled by the shock, succeeded in landing safely behind his own lines.

There is nothing very sensational or romantic in the circling of an airplane around an airdrome, while on the other hand the most daring fiction has never invented and pictured anything half as wonderful and sensational as was that daring dash of that allied airman clean through a burning hostile observation balloon, three thousand feet above the ground. It was another incident demonstrating the dramatic possibilities and the element of romance in flying.

Four ally flyers attacked the hostile observation balloon, which was guarded by three airplanes. While each of the allied flyers engaged one of the hostile flyers in combat, the fourth flew straight for the balloon, opening fire with incendiary bullets at short range. So intent was he upon the destruction of the balloon that he miscalculated the distance. When he found that it was too late to avoid a collision with the burning balloon, the daring airman put on full speed and, withour hesitation, dashed straight through the fiery monster.

The wings of his airplane were broken by the shock but the stays and braces held them long enough to enable him to glide down to safety behind the lines of the Allies. Tattered pieces of the bag of the balloon were still clinging to the wings of the airplane when it reached the ground, grim evidence of its sensational dive, unparalleled in the history of aviation.

Had the fabric not yielded, or had not the gas been ignited before the collision, this airplane would undoubtedly have shared the fate of the Austrian airplane which, a short time before the beginning of the war, accidentally rammed an Austrian dirigible, was upset and crashed down in flames, entangled in the folds of the burning balloon. The result was complete disaster.

© Underwood and Underwood

Before the war this part of the Belgian border contained the most beautiful country roads, shaded by magnificent old trees which the retreating Germans cut down by the thousands

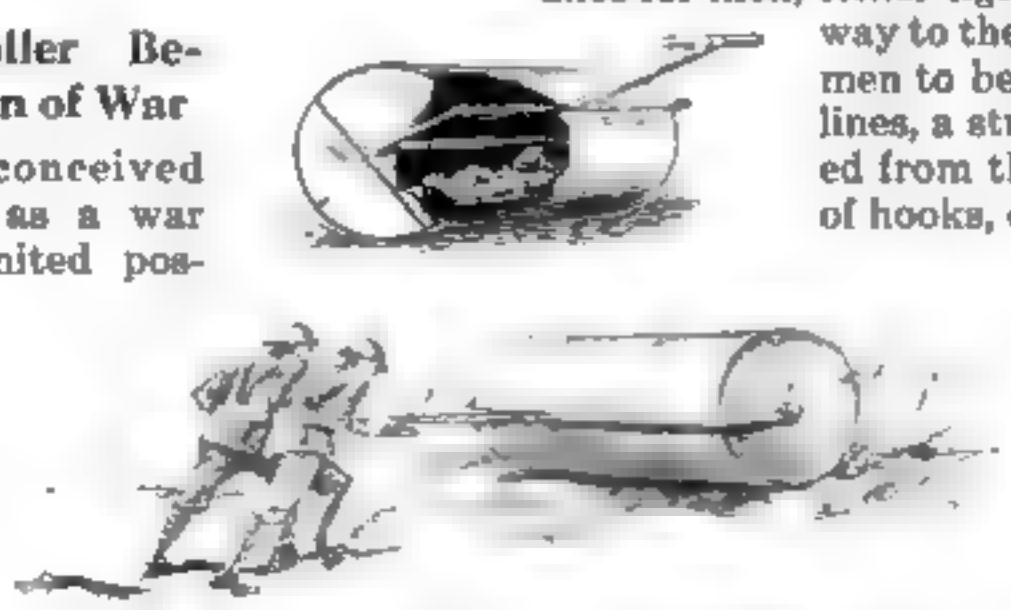
A Beautiful Section Laid Waste by War's Iron Heel

THAT part of Flanders which is located between the Belgian border and the Somme river, was known before the war as one of the most fertile and beautiful agricultural districts of northern Europe.

When the British undertook their drive toward Cambrai, the retreating Germans cut down thousands of the trees lining the country roads and placed them across the roads to hinder the progress of the British.

The Lawn Roller Becomes a Weapon of War

ALTHOUGH conceived primarily as a war machine of unlimited possibilities, the invention upon which J. L. Hyland, of Minnesota, recently obtained a patent, can also lay claim to a wide range of usefulness in times of peace. A hollow cylinder, approximately seven feet long, has a shaft or axle around which it can be rotated. To the ends of this shaft a steering frame is fitted, similar to that of a lawn roller. By means of the steering frame the roller with its contents may be rolled toward the enemy by two or more men, who are protected from gunfire by the roller, which is to be kept between them and the enemy. One or more machine guns may be mounted on the outside of the roller or placed inside of it, so that they can fire through openings in the steel cylinder. When the roller is to be used as a conveyance for men, either fighting men on their way to the front or wounded men to be taken back of the lines, a stretcher is suspended from the shaft by means of hooks, or a semi-cylindrical structure with berths for three men is suspended from the shaft, so that it will swing freely while the cylinder is revolving.

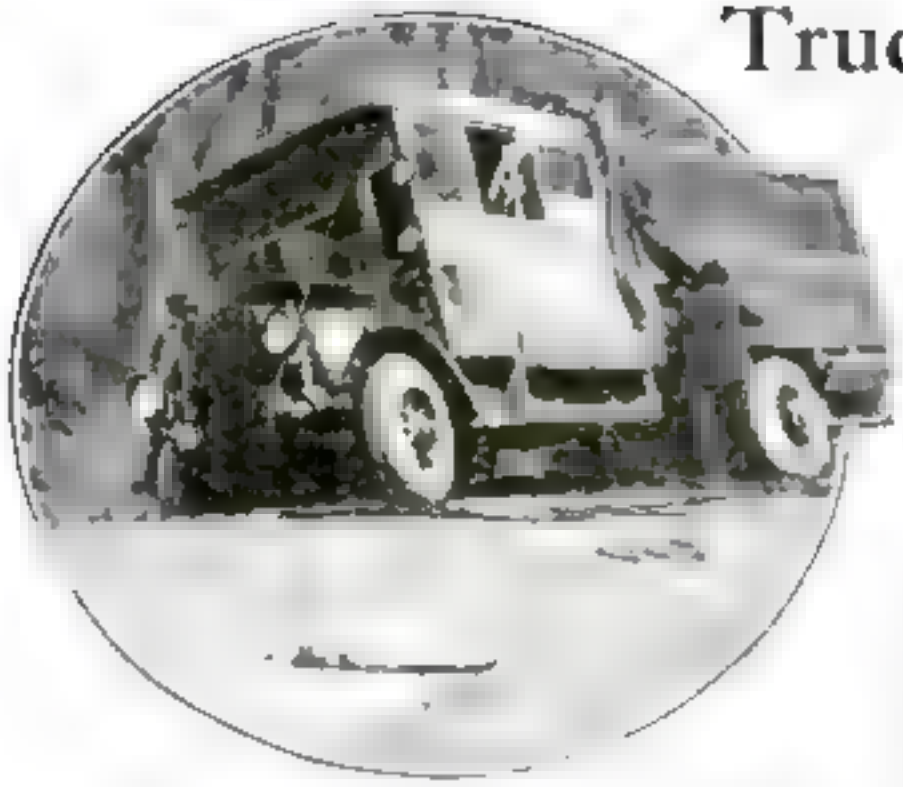


Not a lawn roller, but a machine which protects the soldier from gun fire as well as from liquid fire

Truck Service Overland

Congestion of railroads and scarcity of cars causes long-haul motor truck service to be instigated

By Joseph Brinker



If the truck becomes mired, it is equipped with a power-winch to pull itself out

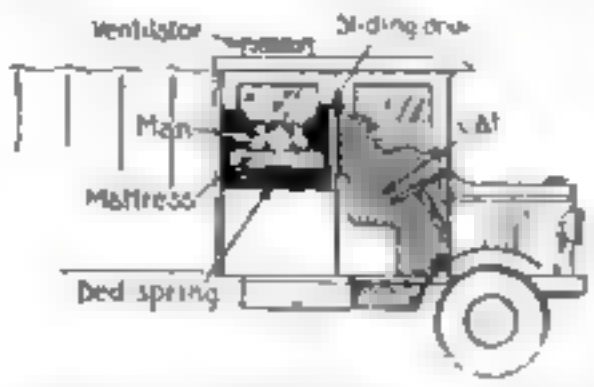
ONLY a few years ago the plan of establishing a regular freight-carrying service with big motor-trucks over a distance exceeding fifty or, perhaps, seventy-five miles, would have been considered extremely visionary if not impossible. Today a large manufacturing concern in Akron, O., maintains a regular freight service by five-ton motor-trucks between Akron and Boston, a distance of 740 miles one way or 1480 miles for the round trip.

The concern manufactures automobile tires and rubber goods and has a great number of branches in cities along the Eastern seaboard. To these it must deliver goods regularly and promptly. The inability to get cars when needed often meant that some branch would run out of tires and would be compelled to refuse business because it could not deliver the goods when a call came.

There seemed to be little prospect of an improvement in the situation and, fearing that the railroad congestion would eventually make it impossible for the company to carry on its business, the heads of the corporation decided to employ a number of large motor-trucks to deliver its goods to all of its branches east of the Mississippi River. They fully realized that it would cost more to ship tires cross-country by trucks than by rail, but they would rather pay the additional cost and continue their business than shut down and do no business at all. Nothing is more expensive than doing no business. The expenses of maintaining the factory and the branches continue, as do the interest on the investment, depreciation, etc., whether one tire or a thousand tires are made a day.

On the way. This is one of the trucks which make the seven-hundred-and-forty-mile journey across country

The trucks now in operation make the 740-mile run between Akron and Boston in four days, whereas it took from ten to fourteen days to make the shipment by railroad. When this saving from six to ten days is considered, it may readily be seen that it pays the company to stand the extra cost of truck transportation which is probably somewhere between seventy-five cents and



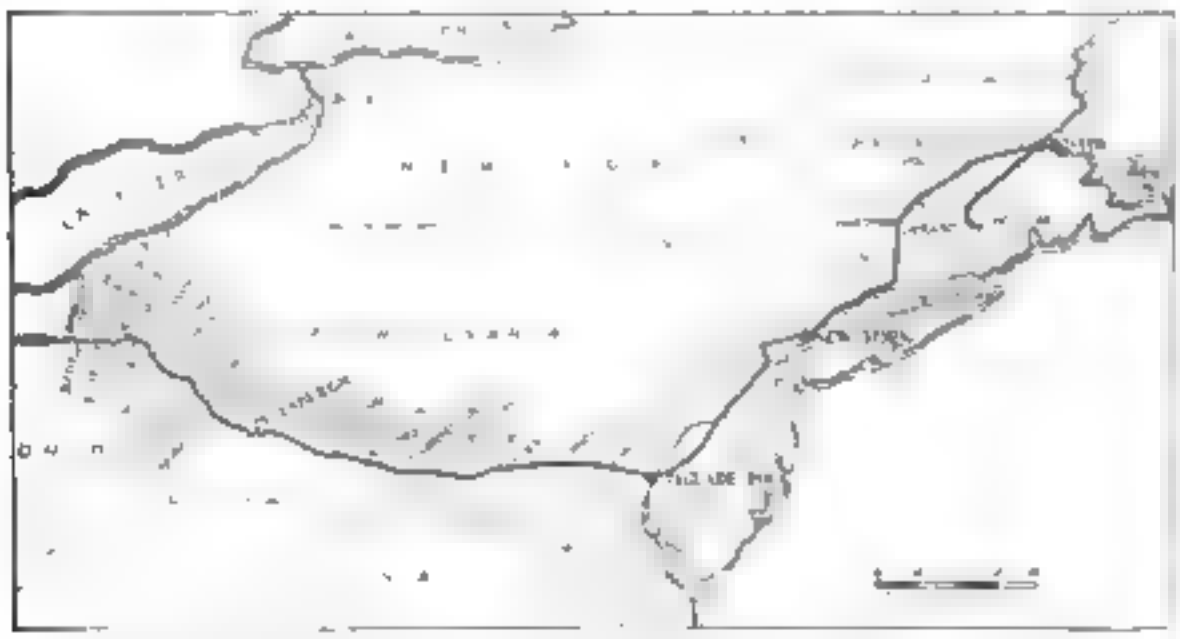
Details of bunking facilities. The crew sleep right in their machines

one dollar a hundred pounds for each hundred miles.

While the war brought about the conditions which made necessary the use of motor-trucks over such long hauls, it also has been directly responsible for the success of the undertaking during the winter of 1917-18. Between forty and fifty thousand motor-trucks will be delivered to the government during 1918. These will be run overland on their own wheels from the points of manufacture to the points of shipment on the eastern seacoast. Close to one thousand of these trucks have already been driven overland since the beginning of the year. The government has demanded that the roads over which trucks have to run must be kept cleared of snow. The states of Michigan, Ohio, Pennsylvania and New Jersey have risen to the emergency and despite the unusual snowfall they have kept a clear cross-country highway from Detroit to New York all winter. This has made it possible to operate the Akron-to-Boston trucks with but few interruptions on account of snow for the reason that from Pittsburgh east through Gettysburg and Philadelphia they follow the Lincoln Highway, the same route over which the government trucks run.

One of the 3½-ton trucks of the Akron concern made the 533-mile run between Akron and New York in sixty hours total time and forty-nine hours actual running time, or at the rate of almost eleven miles an hour for the entire journey. It crossed the Allegheny Mountains after a heavy snowfall and with the temperature at thirteen degrees below zero. A truck-driver that can accomplish this is no novice, and has to be equal to any emergency.

The roads are good, but the grades are sometimes rather steep. Look at this hill



Map showing route followed by the fleet of motor-trucks which is plying regularly between Akron, Ohio, and Boston, Mass.

See that Your Garage Is Ventilated. It Is Dangerous Otherwise

DURING the exceptionally cold months of the past winter, many deaths by poisoning from the exhaust of gasoline engines were reported from all parts of the country. In most cases the victims had been, for some time, in a poorly ventilated or unventilated garage or other room where one or more gasoline engines were running. A careful investigation has established beyond doubt that death in these cases was not caused by the exhaustion of the supply of oxygen in the air, but by the carbon monoxide, an extremely poisonous gas, which is generated by the incomplete combustion of organic substances. It is one molecule each of carbon and oxygen combined. Only thorough ventilation will remove the danger.

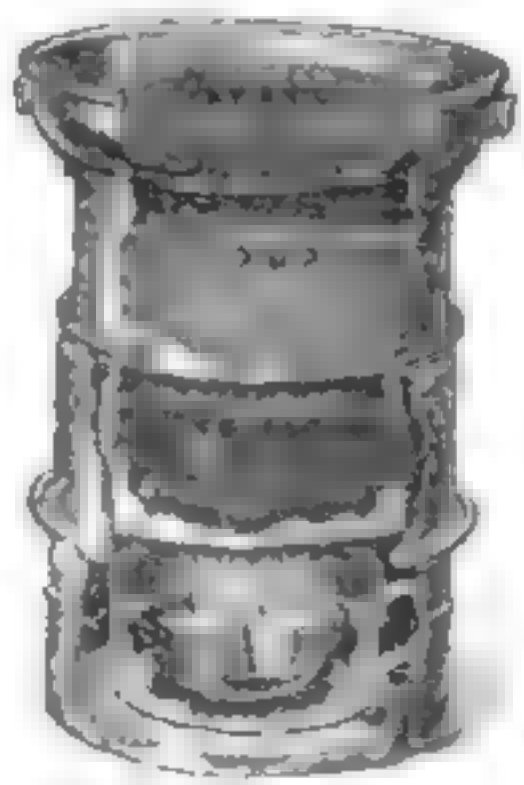
Youngsters are safe on the beaches with this round float

Swimming Harness Will Keep the Kiddies Afloat

TO the numerous devices for the protection of children and grown persons against the danger of drowning a new one has recently been added, which offers some notable advantages. It consists of an inflated circular tube or tire which is fastened to the body of the person using it by a harness arranged in such a manner that it prevents the buoyant tube from slipping down or over the head. The device has considerable buoyancy and will prevent the sinking of any person wearing it. The harness is strong and simple and cannot get out of order. It is a boon to youngsters who are just learning to swim.

Cook Soup, Coffee, and Beans in One Vessel

AN unusually compact and practical mess kit, suitable for soldiers, campers, automobilists and hunters has recently been placed on the market. The kit consists of ten pieces, cleverly nested. It weighs less than two pounds. Alcohol in solid cubes is used as fuel. A glance at the accompanying illustration shows that the lowest two sections of the kit, set up ready for use, form the stove. Set into the upper part of the stove, so that the heat of the burning fuel can reach it at bottom and sides, is a boiler for making coffee. On top of that boiler is another boiler which receives its heat from the steam of the boiling liquid below and which is intended for heating soup, vegetables or any other kind of food. A shallow pan forms the top and may either be used for warming some food which does not require much cooking, or may be turned over and used as a cover. When nested, the kit makes a compact parcel, nearly seven inches in diameter and less than four inches high, held together by a strap which serves as a handle.



When closed this cooker is seven by four inches

The Large Amount of Food That Goes Up in Smoke

HAVE you ever thought how much of the country's food is consumed by fire rather than by human beings? One fire which occurred recently in a grain elevator destroyed 700,000 bushels of corn and 300,000 bushels of oats. Frequent explosions in grain separators also cause an enormous loss of foodstuffs. The United States Department of Agriculture investigated such explosions and found that as many as ten a day occur in the Big Bend country of the Northwest. Barns which have faulty ventilation are another source of food loss by fire because spontaneous combustion of hay and grain is a common occurrence in such places. Sparks from locomotives cause innumerable fires in grain fields resulting in an incalculable amount of damage every season. Much damage is also caused by dropping glowing ashes from cigarettes or pipes, the real cause of more fires, in both city and country, than most people think. Grocery stores which carry inflammable merchandise, such as kerosene, are another fire hazard. Many of these burn each year, destroying a large amount of food. Stable fires which destroy cattle affect the meat supply of the country,—an important item at present.

Planting Tobacco with a One-Man Planting Machine

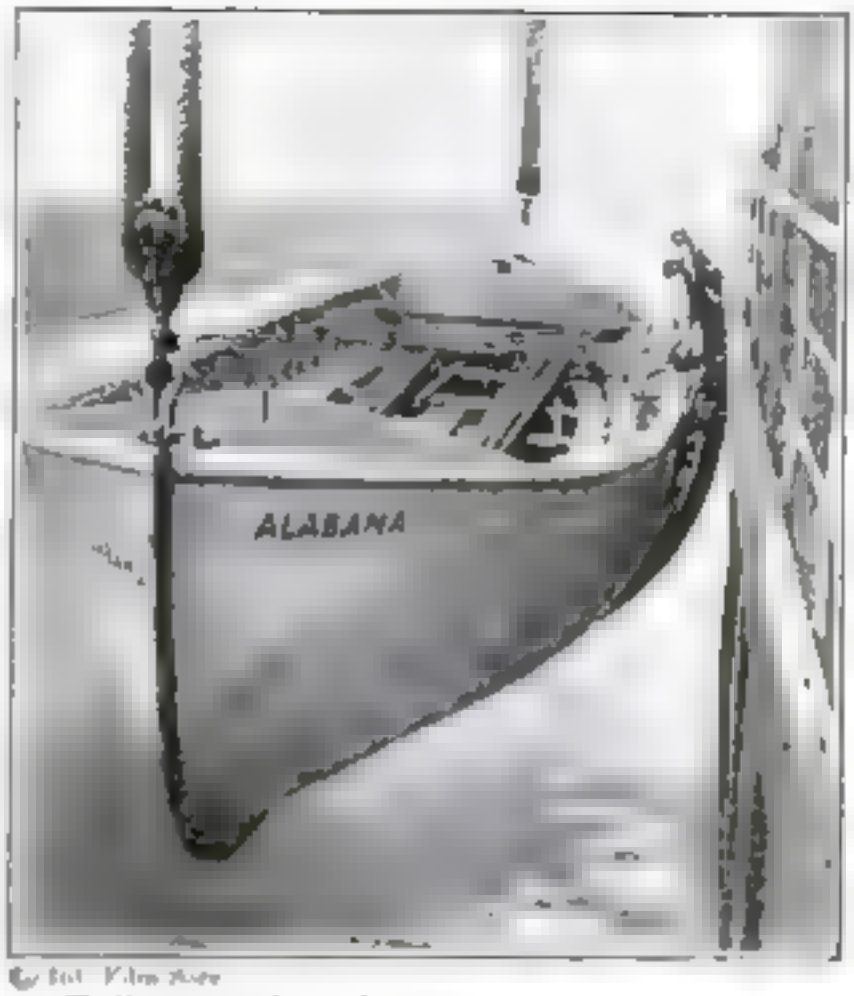
THE old way of setting-out tobacco, tomato, cabbage, and similar plants, was to wait for a showery day, when the ground was damp, take up the plants, and feverishly and laboriously go over the ground with a "peg" and replant them before the ground got dry again. Now, however, there is a machine on the market that does away with all the waiting, all the feverish haste, and all the attendant backache. In addition the plants are better planted, and very few are lost through withering, while the output is several times that of the old method.

In operation the ground is laid out, and barrels of water placed at convenient places in the field, together with boxes of plants. The large cylinder of the machine is filled with water, and the operator takes the machine and a basket of plants (which can be slung around his neck for convenience) into the field. He stabs the point into the ground, drops a plant down the smaller tube and releases the trap. This inserts the plant into the soil and at the same time waters it and presses it down firmly.

As the machine irrigates the plants as it goes along, it is unnecessary to watch the weather as formerly, and plants that are set out in dry weather do as well as those that are set out in the damper weather.

The machine does away with all the body-racking, backaching stooping over that used to make setting-out the *bête noire* of all market-gardeners. Consequently more pains are taken by the men, as it is no longer a hated job to be got rid of as quickly as possible. In other words, it is a device of this kind that makes market gardening a pleasure.

The machine, slung around the neck, sets and waters the plants simultaneously



Roller-carrying frame which enables a boat to be launched from a listed ship

Rolling Down a Ship's Side to Safety in a Lifeboat

A SHIP which is torpedoed rarely sinks on an even keel. Whether it lists to starboard or port depends on the location of the injury. The crew and passengers rush to the high side, clamber into the lifeboats, and drop to safety if they can.

We say "If they can" because frequently the boats strike not the water, but the iron plating of the ship's side.

To prevent just such accidents, a new method of launching lifeboats has been invented. A cradle frame is attached to the outside of the lifeboat nearest the ship. If the ship lists, the lifeboat rides down the ship safely on little rollers with which the cradle frame is provided. The frame and its rollers also serve to keep the boat at a safe distance from the sinking ship.

Euclid Never Thought of This Way of Studying Geometry

THE study of geometry, especially of the more advanced branches of spherical and descriptive geometry makes demands upon the imaginative power of the students. Perspective drawings upon the blackboard are grasped only by the more gifted students.

Mr. J. O'Hara Carson, who is connected with a manual training school in New Orleans, found that the students had no great difficulty in learning the various theorems, etc., so as to pass their examinations, but he noted that many were unable to make a practical application of geometrical principles accurately and constructively. A careful study of the subject convinced Mr. Carson that many of the students could not perfectly visualize geometric figures drawn on a plane surface and that it was this fact which made it impossible for them to apply geometry practically. So he invented several models.

Our illustrations contrast the two methods of teaching geometry

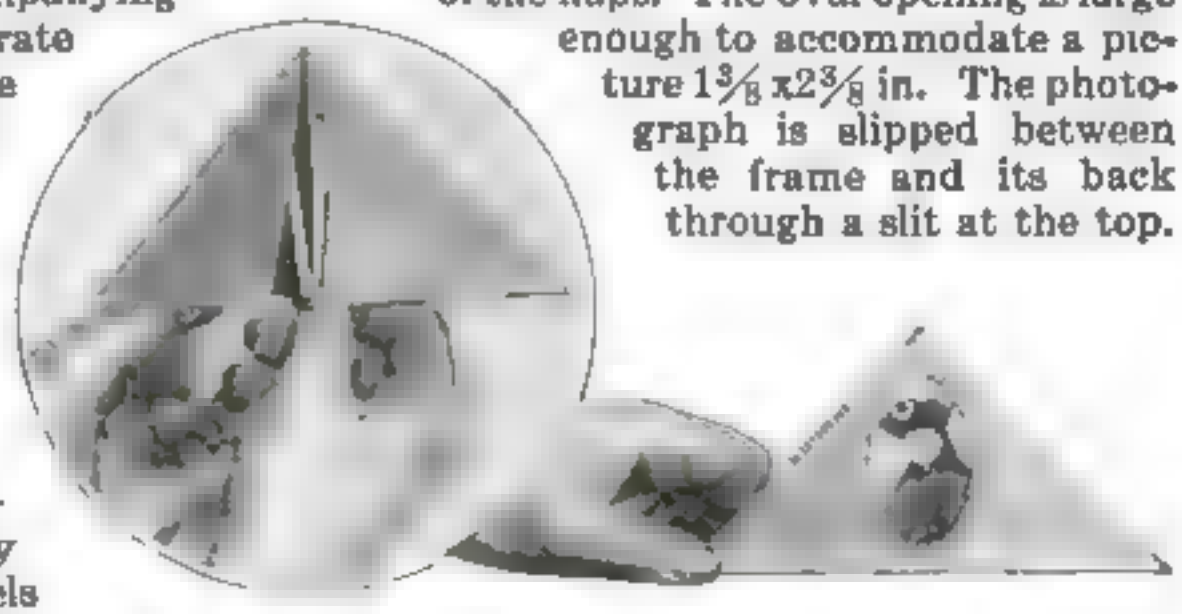
The illustrations accompanying this article clearly demonstrate the construction of these models. The planes may be made of wood, pasteboard or any other suitable material, the lines of wire or strings. To differentiate between lines to be proved, construction lines and imaginary lines, different coloring or different material may be employed. These models will also be useful in teaching geometry to the blind.

New Uses Have Been Discovered for Blue Glass Electric Lights

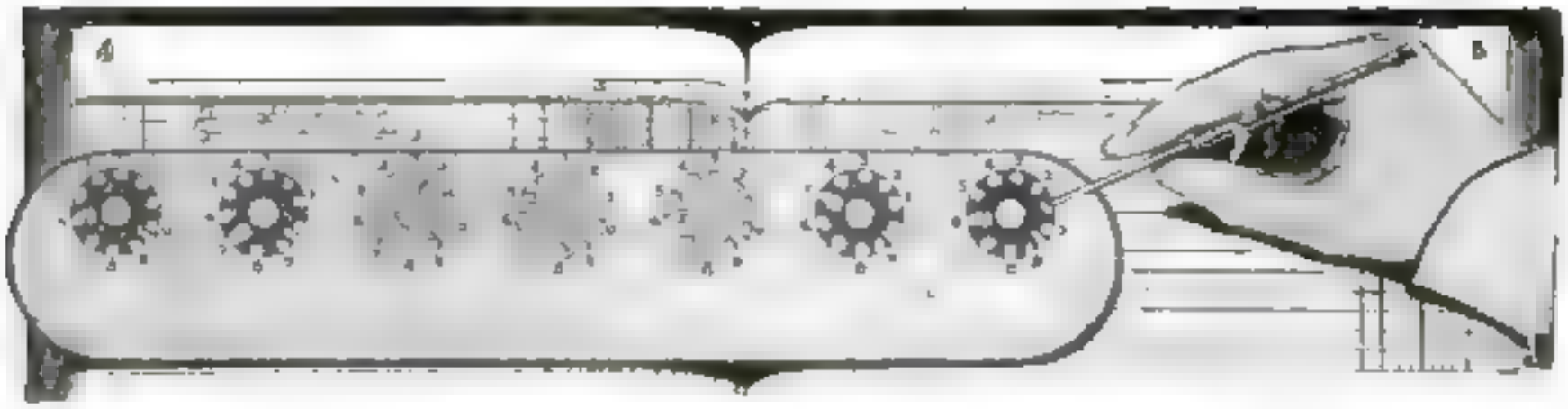
NEW uses are constantly being found for the blue glass electric light incandescents which already have a wide range of uses. A big laundry in the South has installed blue bulb lights for the reason that this light makes the yellow stains in cloth show up plainly, and therefore enables the workers to do better laundry work. In the West a large mining company uses blue glass lamps over concentration tables as this light assists in bringing out the line between the zinc and iron ore.

A Picture Frame and Easel for the "Girl I Left Behind Me"

THIS photograph frame is for the soldier boys. The triangular flaps are folded back, and the loop ribbon provided is slipped around the corner of one of the flaps. The oval opening is large enough to accommodate a picture $1\frac{3}{8} \times 2\frac{3}{8}$ in. The photograph is slipped between the frame and its back through a slit at the top.



The first illustration shows the simple principle of the frame, the second its appearance with a photograph



An ingenious adding device that can be operated on the same principle as a dial on an automatic telephone. It is adapted to the work of accountants and bookkeepers

Simple Adding Machine Convenient to Handle

WITH no keys to press and no levers to manipulate; the simple adding machine shown in the accompanying illustration is particularly adaptable to the work of accountants and bookkeepers. The device consists of a base with seven notched dials representing cents, dollars, and tens, hundreds, and so on up to $99,999.99.

The device operates on the same principle as the dial on an automatic telephone. For instance, if you wish to add $3.64 and $42.80, you place the pencil-like stylus which comes with the machine, opposite figure 3 in the dollars column and turn the dial to the right as far as it will go. Similar movements are made for the 6 and the 4 in their respective cents columns. Inside each dial is a large notch or window and the figure 3.64 will be found registered in red figures in these notches in the first three dials from the right. If $42.80 is registered in like manner, the total will appear in red figures on the four dials from the right.

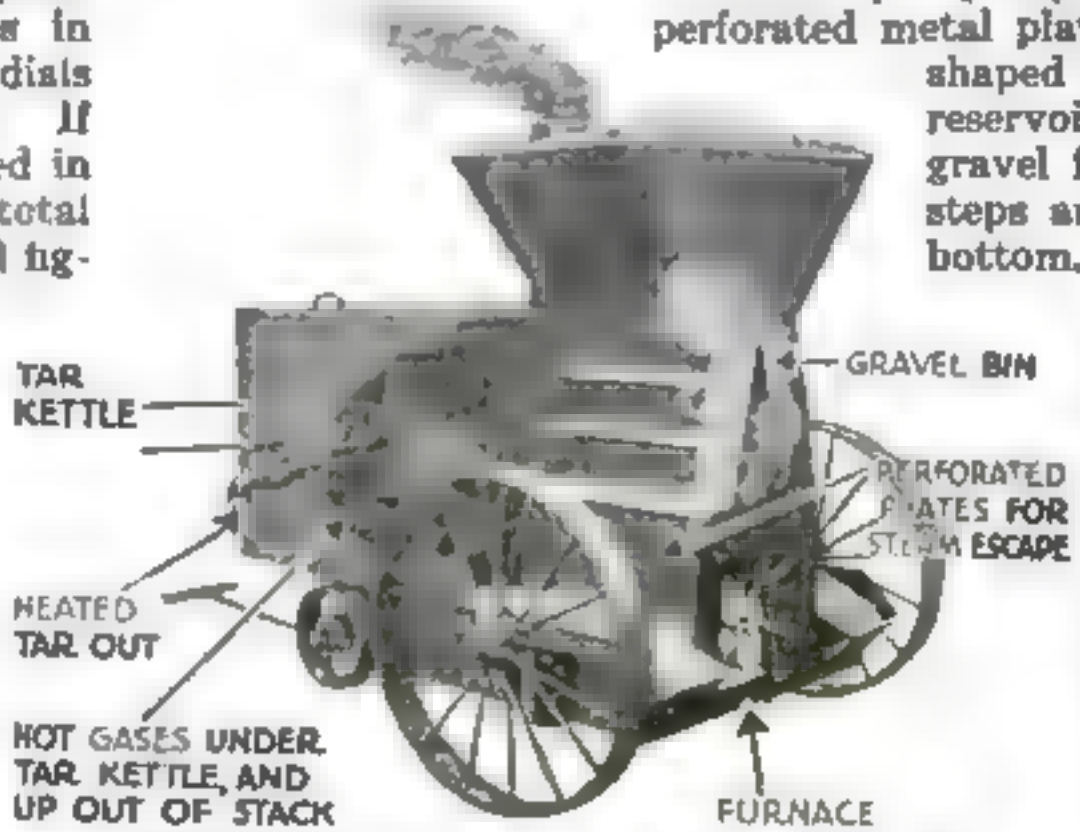
For subtraction the same principle is used, except that the totals are shown on the white figures. The machine can also multiply

Heating Tar and Gravel Separately But in One Operation

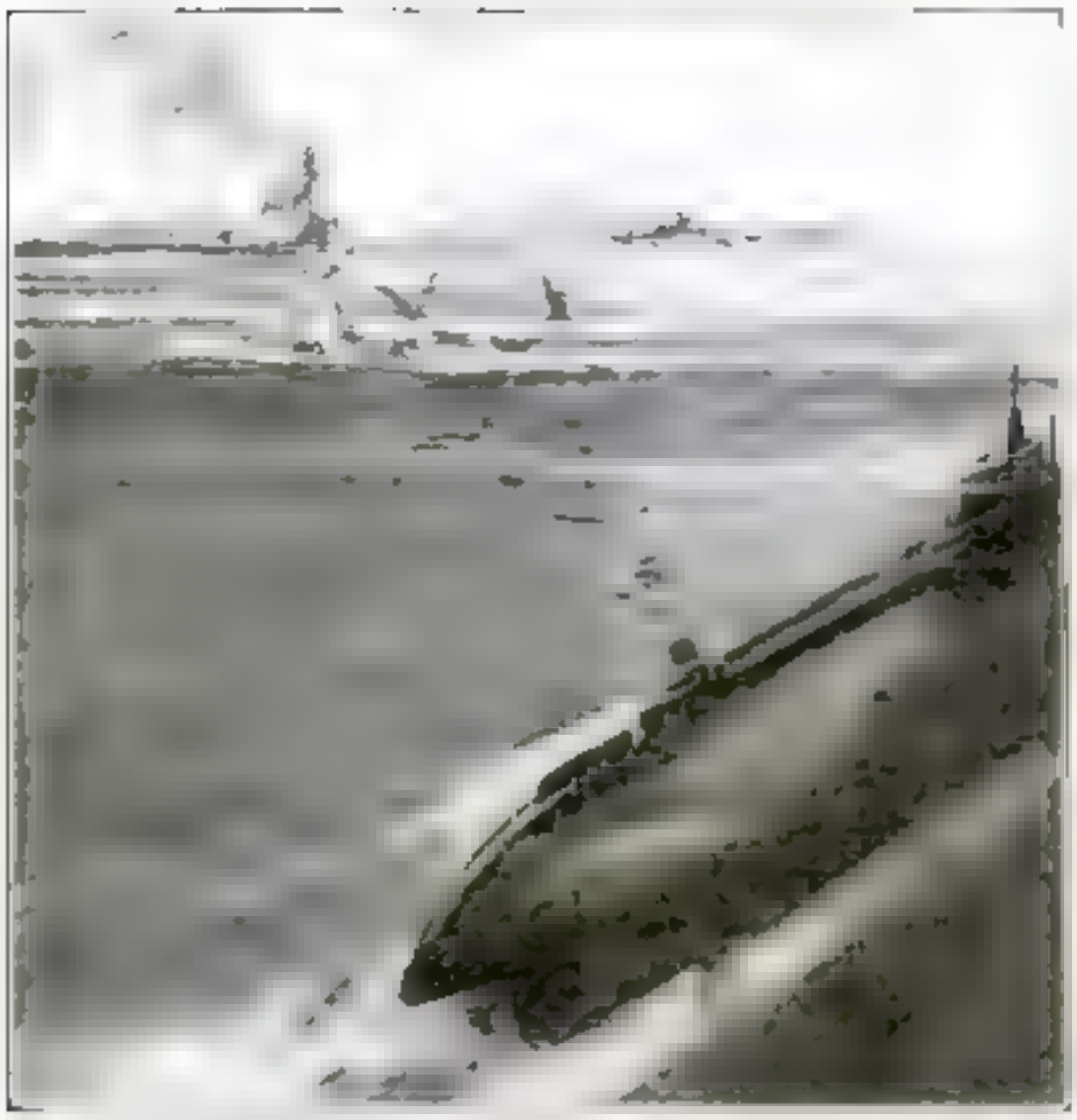
EMULATING the famous hunter of the olden days who killed two birds with one stone, a New Jersey manufacturer has recently brought out a combination tar and gravel heater that heats these two dissimilar materials quite independently but with one operation. The device, which is shown in the accompanying illustration, is particularly fitted for street paving where block pavements with tar joints are laid.

The apparatus consists of two main parts, a rectangular tar kettle and a Y-shaped gravel-bin, with a furnace extending beneath both parts, from one end to the other. The furnace is fired from the gravel end of the device. The smoke and gases escape through an ordinary stove pipe in the kettle end.

The inside of the gravel heater is triangular-shaped while the outside is made up in steps consisting of perforated metal plates. The Y-shaped top acts as a reservoir bin and the gravel feeds down the steps and out at the bottom. The perforations in the step plates allow the moisture in the gravel to escape readily as it is turned into steam by the heat of the fire, thereby making it possible to heat both tar and gravel.



Combination tar and gravel heater device in operation. The furnace is fired from the gravel end



Gulls, which have been fed from a submarine, get the habit of watching for the underwater craft, and thus reveal their presence to the watchful eye of the enemy

Training Sea-Gulls to Become "Spotters" of Submarines

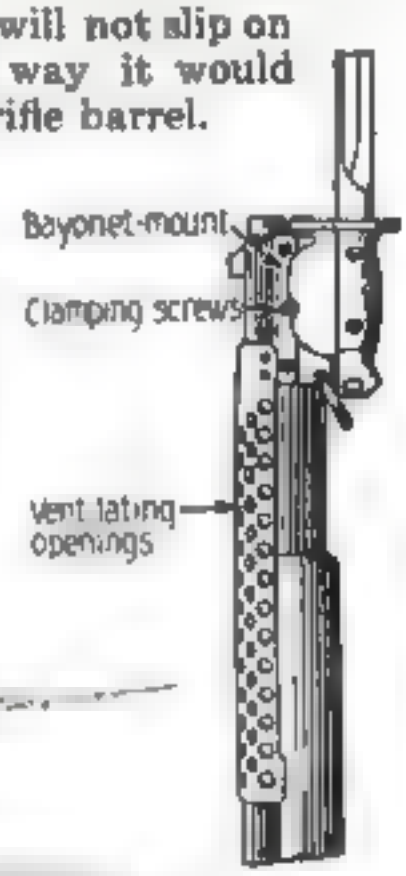
NAVAL officers have frequently had the opportunity to observe that swarms of sea-gulls follow in the wake of submarines. The birds are attracted by the unusual spectacle of a whalelike monster moving through the water, and are eager to pick up garbage.

This observation which, in a few instances during the present war, is said to have led to the timely discovery of the dreaded proximity of a U-boat, suggested to Dr. A. D. Pentz, Jr., of New Brighton, N. Y., the plan of training the gulls to follow in flocks in the wake of submarines. He suggests the use of a hopper, fifty-four inches long, made of sheet steel. It is securely bolted to the top of a submarine and filled with chopped fish. This bait is released from time to time by the turning of a crank operated from the inside of the submarine used for training the gulls. The bait, which would naturally rise to the surface of the water, would attract the gulls and cause them to follow the submarine.

Insulating a Hot Rifle for Bayonet Use

APPRECIATING the fact that a rifle barrel, heated with much rapid fire, is not a particularly inviting article to handle, and that nevertheless it must be handled when it is required to use the bayonet, Mr. Henry Brewer, of Connecticut, has invented an insulating device.

The insulator consists of a perforated metal shield, a little more than semi-circular in cross-section, and sufficiently larger in diameter than the barrel to form an insulating space. It is not at all in the way of the user of the rifle, and as it is merely attached with two or three screws, it does not interfere with the proper cleaning and care of the rifle. The inventor asserts that in view of the perforations in the plate it will give a much better grip than it was possible to obtain before, as manifestly the hand will not slip on the rough plate the way it would on the smooth, hot, rifle barrel.



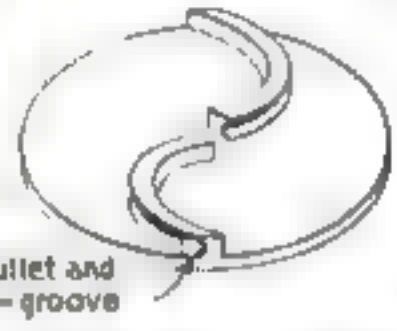
This insulating shield will enable a man to grasp a hot rifle barrel without discomfort or slipping when he makes use of his bayonet

The Mechanical David

Centrifugal force propels the bullets towards the enemy with terrific force, at the rate of 20,000 a minute

THE present world war has brought out so many striking reversions to primitive principles and methods of attack and defense that the invention of a gun based upon the same principle that enabled David to lay low the mighty Goliath, should, by rights, cause no particular surprise. The gun, which is shown in the accompanying illustration, is the invention of Levi W. Lombard of Boston, Mass. Its general appearance is more that of a feed cutter or coffee-mill, but it is said to be capable of firing 20,000 projectiles a minute with sufficient force to penetrate steel plates three quarters of an inch thick at a distance of several hundred feet, a noteworthy achievement.

Looking down into the hopper from which the bullets are fed to the rapid-fire gun



The Lombard gun is based upon the principle of centrifugal force. A disk, twelve inches in diameter, which is rotated at the rate of 20,000 revolutions a minute, has a curved ridge from its center to opposite points of its periphery. The ridge has a groove on one side, which forms the channel for the bullets. These are fed from the center of the disk, one at every revolution and are expelled by the centrifugal force of the revolving disk. The bullets leave the gun all in the same plane, but not all in the same direction. They come through a slit in the casing of the revolving disk, which represents about five degrees of the periphery. Actual tests have shown that the linear velocity of the bullets (2000 feet per second) is greater than the velocity of the disk.

It is stated that, no matter what may be the speed of the disk, the bullets always come out at the same place. This result, which involves complicated mathematical and mechanical problems, is obtained by the feeding mechanism and the peculiar form of the curve of the grooved ridge. One of the illustrations shows a top view of the feeding hopper. The gun may be revolved by an electric motor, a gasoline engine or by hand power.

The disk of the gun may be revolved by an electric motor, a gasoline engine or by hand power

Beware! The Tanks are Coming—Under the Table

OUR picture shows a toy tank with its young commander. This is a most realistic toy, although it is very inexpensive. The sides and body are made of wood, and the gun turrets are merely other scraps of wood nailed to the sides. The gun ports are drilled obliquely so that the guns point forward. Ordinary paper cigarette holders serve as guns—fired in a most realistic manner by inserting fireworks into them. These toys have no motive power, as they are primarily intended for the very little folks, but they make fine stage properties in sanguinary play-room battles. They are not dangerous even for youngsters.

Here is the toy tank in full action. Note the gun being fired

Novel Idea of Converting Shell-Cases into Shoe Protectors

TRENCH life is extremely hard on shoes. That has been definitely proved. Rough usage and exposure to mud and water quickly wear them out. For a long time the men in the trenches have tried to devise some method of prolonging the life of soles and heels. It was a bright and happy idea of some French soldier to use discarded shell-cases to strengthen the heels and soles of his shoes. The plan proved thoroughly practical, and soon many other French and British soldiers imitated the example of the inventive poilu.

The shell cases are cut open lengthwise and rolled flat. Then the soles and heels are cut out with strong shears to fit the shape of the shoes and tacked or screwed down. The illustration shows a pair of shoes thus metal-soled and heeled and the tools used in doing the work. It is scarcely necessary to state that both the British and the French authorities encourage this economy in shoe materials.

A pair of shell-soled trench shoes and the tools used in doing the job properly

Why Isn't It Hotter Nearer the Sun Than Away From It?

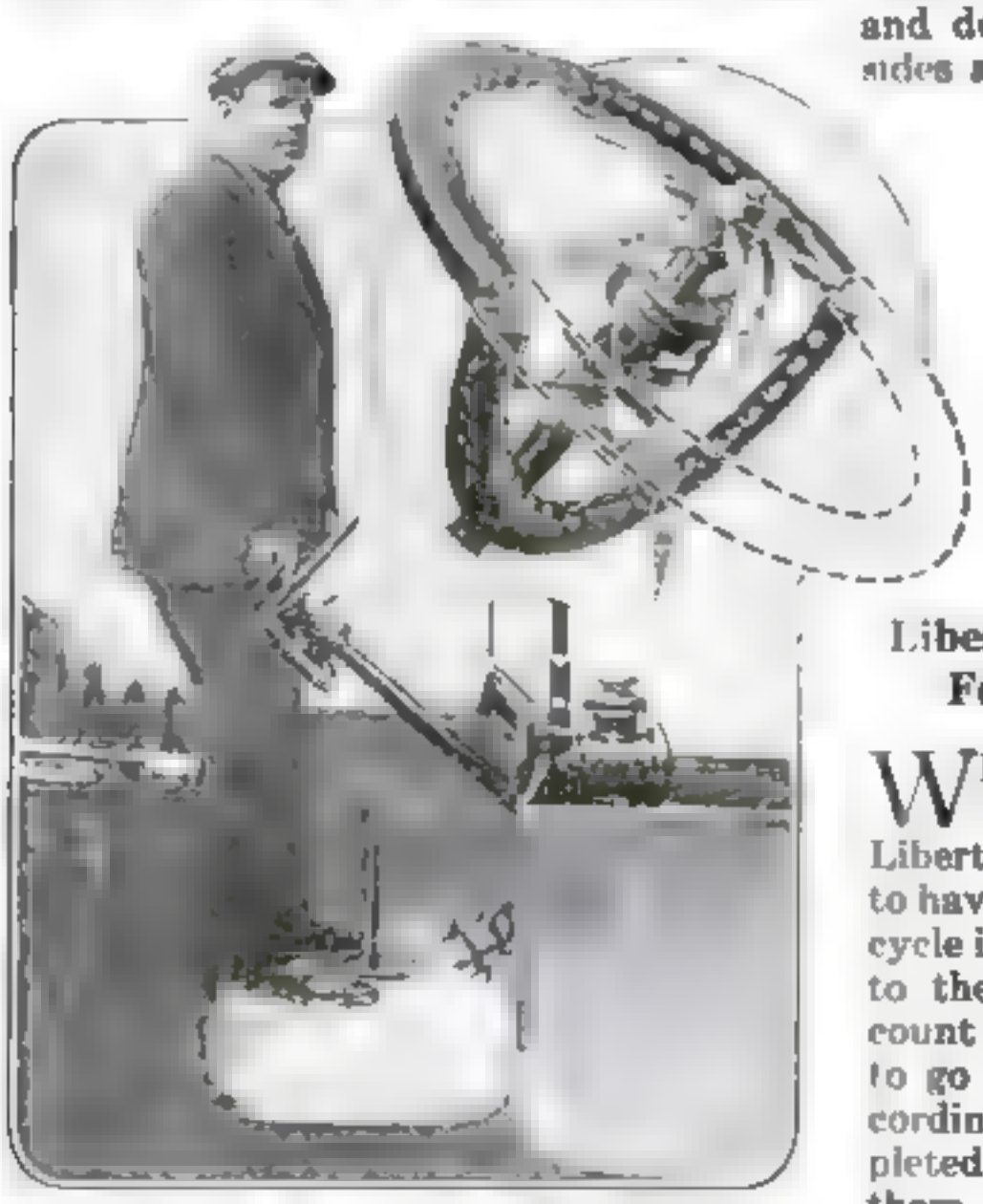
WHY is the air generally much colder a mile above the earth than near the ground? The heat of the atmosphere comes from the sun, but by a somewhat indirect process. The incoming sunbeams are only slightly absorbed by the dry air at high levels, and so have little effect on its temperature. In the lower regions of the atmosphere there is always a considerable amount of water vapor (water in the form of gas), and this substance has a relatively large capacity for absorbing heat from sunshine. Lastly, the earth absorbs all the heat that falls upon it, and then gives it back, by radiation or conduction, to the air above it. Thus the atmosphere is mainly heated from below and not from above. Air heated near the ground tends to rise, but it cools rapidly in rising. As it reaches higher levels the pressure upon it is less; it expands, pushing away the surrounding air, and it uses up in this work some of the energy that it originally possessed in the form of heat. This process is referred to by scientists as "adiabatic cooling."

This explains why the heat of summer often seems to come up from the ground, rather than from the boiling sun above.

Folding Steering-Wheel Locks Automobile and Makes It Easy to Get Out

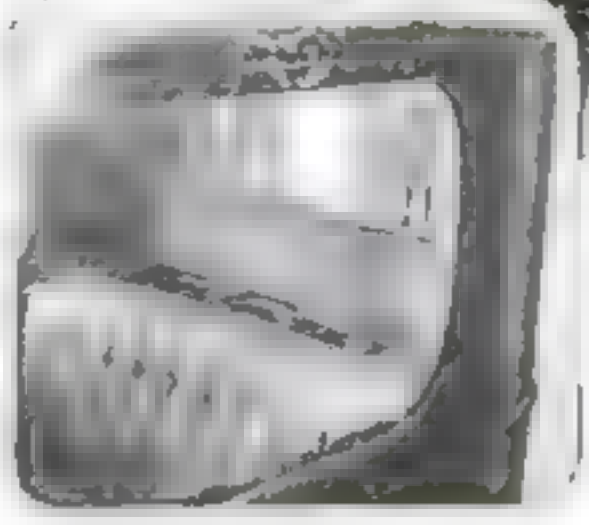
THE latest comfort-giving automobile accessory consists of a folding steering-wheel which performs the dual purpose of making it easy for the driver to get into his seat and of locking the car in place so that it cannot be steered if thieves should attempt to make off with it. Folding steering-wheels are not new; neither are steering wheels that can be locked. However, the combination of the two is a new idea of greater simplicity than two separate devices.

Instead of the entire wheel sliding about the top of the post as in most folding wheels, the one shown is hinged at opposite points. The rear half may be swung down and under to permit the driver to stand erect between his seat and the wheel instead of having to slide into his seat.



Here is a new combination folding steering-wheel and steering-lock for your car

This picture shows the side window being fitted to the automobile body



Showing how the windows are stowed to prevent rattling when not in use

Carrying Automobile Sedan Parts Without Rattling

MANY of the convertible sedan automobile bodies carry the side window and door sashes in pockets in the body sides and doors. The result is considerable car rattle, especially when the car is traveling over rough roads. To offset these difficulties, several manufacturers are making the glass panels integral with the frames so that they may be entirely removed and placed in a wider and roomier compartment back of the rear seat, as shown in one of the accompanying illustrations.

Liberty Motor-Cycle to be Worthy Follower of Liberty Airplanes

WELL, we have the Liberty engines, the Liberty airplanes, and the Liberty motor-trucks. Now we are going to have Liberty motor-cycles. The motor-cycle is one of the most important factors to the intelligence departments on account of its speed, handiness, and ability to go where an automobile cannot. Accordingly arrangements are being completed to standardize them and turn them out in vast numbers, like other necessaries.

An Enterprising Photographer "Shoots" Draft Army

IT was an event to be remembered when the 10,000 men, forming the New York contingent for the selective draft army marched in parade on Fifth Avenue, New York City, on Washington's Birthday, during a blinding snowstorm. In spite of the unfavorable weather, photographers managed to get many excellent pictures of the parade. Particularly interesting were the motion-pictures taken by an enterprising motion-picture concern which obtained the views in a novel manner. By special permission a giant tripod, towering high over the heads of the marchers and the multitude of spectators, was set up at the intersection of Fortieth Street and Fifth Avenue. From this strategic spot the camera-man, who mounted the tripod with his camera made an excellent and complete record of the parade as it passed that point.

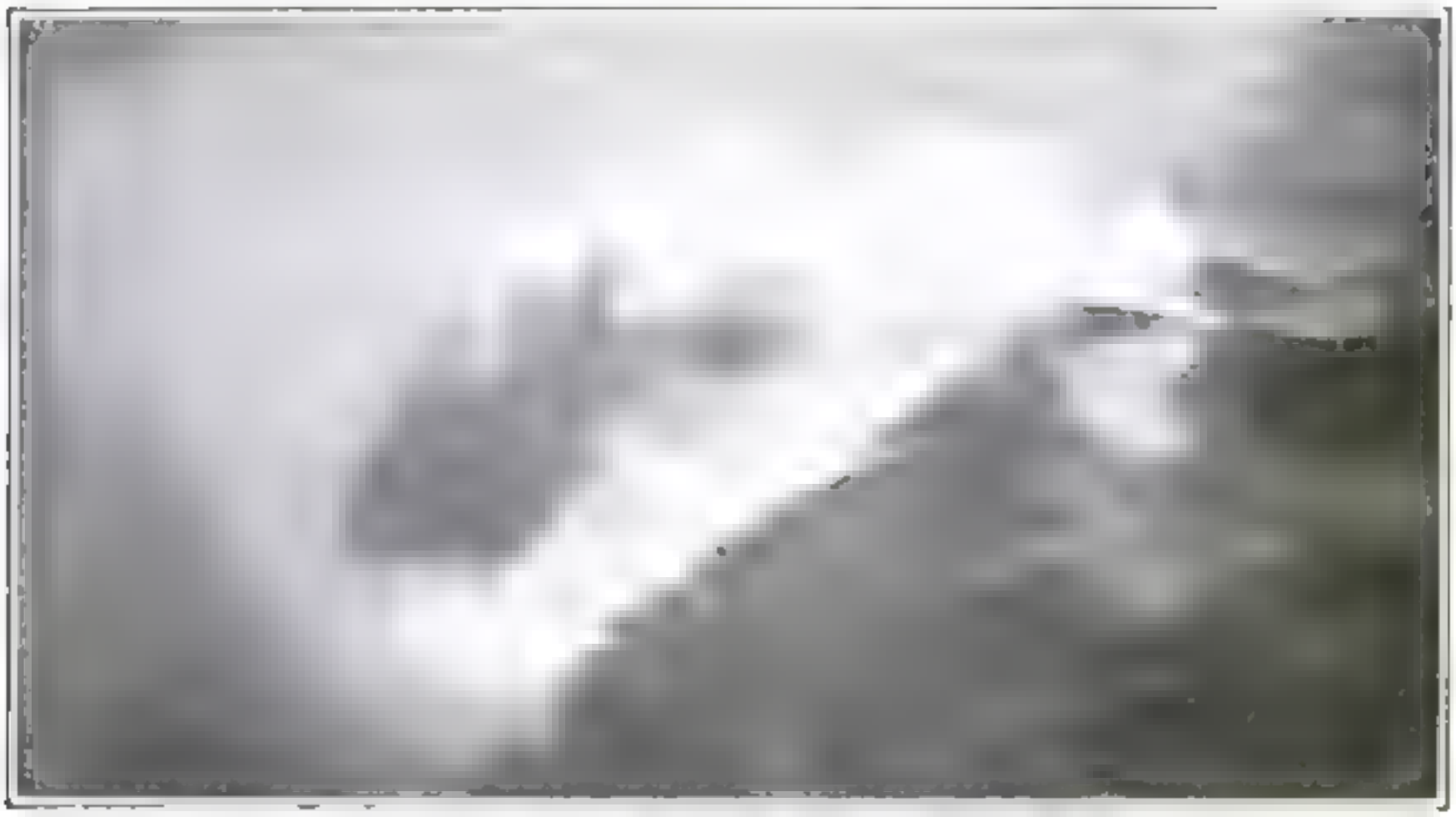
Draft army parade photographed in New York on Washington's Birthday

High-Water Street Cars Recently Used in Cincinnati

WHEN the Ohio River is on a rampage, the streets in the lower section of Cincinnati, in the levee district, are often flooded and many times traffic on the car lines has had to be stopped.

To remedy this condition the engineering department of the traction company devised the high-water cars shown in the accompanying illustrations. The car bodies are placed upon trestles resting upon the wheel trucks, so that the floors of the cars are about five feet above the level of the street. The front car furnishes the power with its motors up high and dry and communicates it to the car wheels by means of sprocket chains. The trailers are similarly raised and three steps give access to them. These cars are capable of making their way through water of a depth of five and a half feet and are giving great satisfaction.

Cincinnati's high-water cars, specially designed so that car and running gear are all out of the water. The cars can run in five-and-a-half feet of water and operate in flood time



This remarkable picture, which looks so much like a glorious sunset or cloud effect, is in reality a great pile of coal in flames at Superior, Wis. It was finally put out with bicarbonate of soda

Extinguishing Fires in Coal Piles with Bicarbonate of Soda

IT has long been known that as the result of spontaneous combustion fires often originate in the interior of large coal piles, especially when the coal is fine and contains a large percentage of sulphur. Some of the recent coal-pile fires have demonstrated, however, that under favorable conditions spontaneous combustion is liable to take place even in piles composed of coal in large lumps. It depends principally upon the nature of the coal and upon the amount of rain to which the pile is exposed.

John A. Thomas, of Columbus, O., who made a special study of spontaneous combustion, is the originator of a simple and effective method of extinguishing such coal fires. The application of his method has prevented enormous damage in several instances, where fire had originated in large accumulations of coal.

Mr. Thomas uses a strong solution of bicarbonate of soda, which he throws upon the burning coal-pile by means of a force pump. The carbon dioxide, released from the soda puts out the fire. The gas is assisted by the water which, by the heat of the burning coal, is transformed into steam.

The illustration shows the burning coal-pile at Superior, Wis. A considerable part of the 100,000 tons comprising this pile was saved by Mr. Thomas, after the fire had been raging more than three weeks in the interior of the pile.

Why It Is That Bricks Are Made with Straw

EVERYONE is familiar with the story of how Pharoah commanded his taskmakers to increase the burdens laid on the Israelites by withholding from them the straw wherewith to make bricks; and doubtless many have wondered wherein the hardship lay. By most people, probably, the view has been held that the straw was added as a binding material, much as hair is used in mortar; but such an explanation is scarcely satisfying when it is remembered that the straw fiber is a very weak one. Alexander Findlay says in his "Chemistry in the Service of Man" (Longmans, Green and Co.):

"About fourteen years ago it was found by Dr. E. G. Acheson, to whom we owe the discovery of carborundum and the process of making artificial graphite, that when clay is mixed with a dilute solution of tannin, it becomes much more plastic, and the strength of the dried brick is, moreover, greatly increased. Although straw does not contain tannin, it was found that when straw is treated with water, the extract obtained has the same action on clay as tannin has, the plasticity of the clay and the hardness of the brick being greatly increased."

Shooting a hawk from a motorcycle while riding at forty five miles an hour. A highly successful method of killing birds, employed by an enterprising Los Angeles taxidermist

Shooting Hawks from a Fast Motorcycle While Traveling at Speed

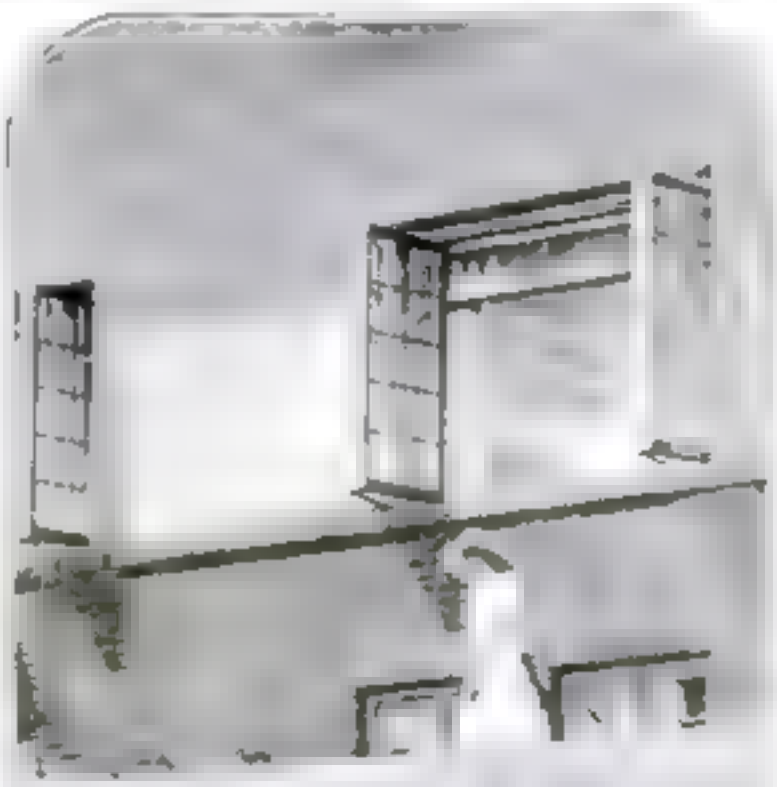
EVERETT COLBURN, a Los Angeles taxidermist, has evolved a new method of hunting hawks and other birds of prey which is spectacular and hazardous, but nevertheless efficient.

Mr. Colburn, who is also a motorcyclist, noticed that often when he was touring over the country highways, hawks would frequently sit on telegraph or fence posts at the side of the road and allow him to pass on his machine. They had come to regard the machine as a harmless thing. So, by way of experiment, he constructed a bracket on the top of the gasoline tank of his machine for carrying a shotgun. Then he set out over the highways to see what results could be obtained.

The first bird sighted was a fine red-tailed hawk that sat on a fence post. As the bird flew from the post, Colburn, speeding at forty-five miles per hour, grabbed his gun and killed the hawk

The Windows Fold Back Out of the Way and Let in the Air

A NEW type of casement window, shown on the house in the accompanying illustration, overcomes several of the ills that casements are heir to. While the windows are held rigidly at both the top and the bottom, they may be easily moved from side to side. When shut they make a tight, weather-proof joint. Thus there is an unobstructed opening when the windows are opened and a real window when they are closed.



This casement window is weather-tight and is easy to open and close. It does not rattle

Almost any style of finish that is possible with other windows may be used, including the division of the sash into small panes or fitting with art glass. Sliding screens placed on the inside next to the screens are used; the shades and draperies are placed inside the screens. This allows the adjustment of the shades without opening the screens, and also prevents the shades and draperies from being blown outside when the window is open.

A Floating Invitation to Suicide

It's a mine with an imitation periscope projecting from the water

"PERISCOPE in sight!" calls one of the lookouts on the starboard side, excitedly pointing to a small object a few hundred yards away, which his keen and well-trained eye has just discerned. A dozen glasses are trained upon that object a moment later and as many observers, firmly convinced by what they see, that they have the periscope of a hostile submarine before them, begin to fidget in anticipation of the coming events. The first impulse of the officers of the ship is to head straight for the periscope and to ram the submarine to which it belongs.

The captain, knowing that in the early months of the war eighty British ships were sunk because their impetuous commanders thought that periscopes are always associated with submarines, does not yield to the rash impulse of his officers, but decides to try a shot at the periscope first. The second shot hits it squarely and there is a terrific explosion.

It was a mine—not a submarine—a mine, equipped with a seductive imitation of a periscope designed to lure on overbold vessels. An attempt to ram the supposed submarine would have been fatal to the ship. The mine is the invention of a foreign officer now working for the United States Government and proved to be highly effective in the early part of the war, until the commanders of vessels had learned to curb their impetuous impulse to ram everything that looked like a periscope.

Ships will do well to steer clear of this imitation of a periscope; to ram it means exit

A large metal cylinder holds a firing charge of five hundred pounds of tri-nitro-toluol, wet gun-cotton or dynamite. Bolted to the lower end of the cylinder is a weight to keep the mine upright and so far submerged that only the tubular firing device, simulating a periscope, shows above the surface. The trigger ends are in the top of the periscope-like device. The trigger is so arranged that any pressure upon it causes it to break a bottle filled with sulphuric acid. The acid sets off the priming charge in the lower part of the tube, and this causes the explosion of the main charge of the mine. Of great importance is the vertical fin attached to the outside of the mine. It acts like the rudder of a ship and prevents the mine from spinning around under the influence of wind and wave action, which adds in a large measure to the value of the invention.

Charged with T. N.T., wet gun-cotton or dynamite

The seat gives the baby just the right height for comfort at the dinner table

This shows the construction of the seat, which may be compactly folded up

How to Change an Ordinary Chair Into a High Chair for Baby

L. L. FARRER, of Welland, Ont., had three little children of high-chair age in his family, but only one high chair. This set Mr. Farrer thinking and eventually the idea of constructing a contrivance for temporarily changing a low into a high chair took definite form in his mind. After a number of disappointing attempts he evolved the invention pictured.

The contrivance consists of a wooden seat which can be attached to the back of an ordinary chair by hooking the heavy wire connected with each folding armrest over the back. By turning the spiral of the hooking arrangement the height of the seat can be adjusted to the requirements of the child using it. When the seat is not in use it can be folded up so as to take but little space.

Feeding and Watering the Chickens Automatically

DON'T scatter chicken feed by hand It is a waste of time nowadays. Nikilas Lappas, of Salem, Massachusetts, has patented a machine which does the work and never forgets. At regular intervals his apparatus delivers measured quantities of water and feed for poultry without the aid of a human hand.

The barrel shown in the accompanying picture contains water which drips from the spout very slowly into the tilting bucket below. A suitable valve regulates the rate at which the water drips into the bucket. It takes eight hours for the bucket to fill. When full it tilts and dumps the water into a trough. From the trough the water flows to a basin, from which the chickens drink. Attached to the weight suspended from the tilting bucket are bells which jingle as the bucket is overturned and remind the chickens that meal time has come, quite in the best boarding-house style. The feed is likewise supplied at regular intervals automatically, from the large can which surmounts the apparatus. It flows through a spout into the hopper, and thence on to a curved delivery plate which scatters it in all directions just as if it were thrown out by hand.

The tilting of the water bucket when it is emptied supplies the motive power for operating the device and once started it requires no attention.

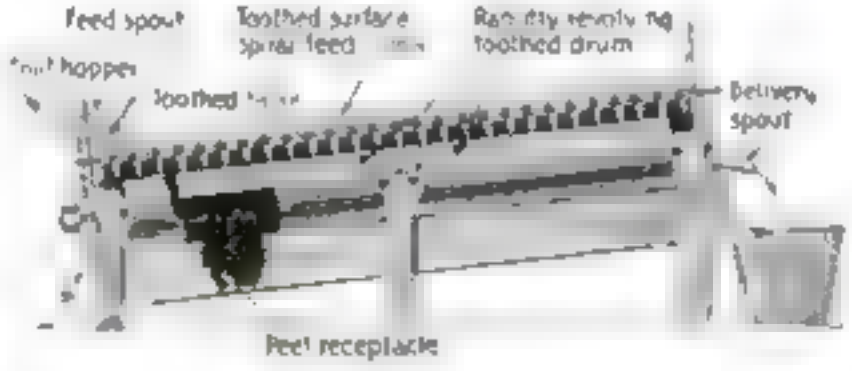
Here is chicken-feeding reduced to a system. Water and feed are automatically dealt out

Even Fruit Skins Are Utilized Now. This Machine Does It

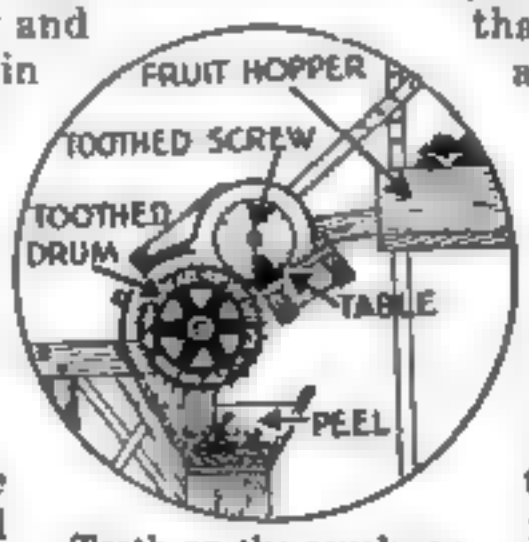
AN apparatus which will dexterously peel everything from limes to large grapefruits (the first stage in the extraction of useful oils from the peels) has been developed by the experts of the Department of Agriculture. With a battery of these machines placed in a factory, many thousands of dollars worth of by-products can be utilized.

Fruit of all sizes and shapes tumbles down through an opening in contact with a motor-revolved screw

Unlike other peeling machines, the fruit does not have to be sorted to fit into the gratings. Fruit of all sizes and shapes tumbles down through an opening in the storage box on the top of the apparatus and falls in between the flights at the end of a long horizontal screw. This screw is revolved by a motor with the result that the teeth, projecting from both sides of the screw flights, take hold of the material and turn it around against a drum which is rotating in the opposite direction.



The drum is also provided with short teeth. The teeth of the screw and those of the drum, working in opposite directions on the fruit, grate the skins off. As the screw tends to turn the fruit around, it also pushes the fruit forward over the length of the drum. The peels are thus made to come off in spirals. The peelings fall into a trough at the bottom of the machine and the fruit pulps are dropped out on a chute at the side.



Teeth on the revolving drum. The peelings come off in spirals

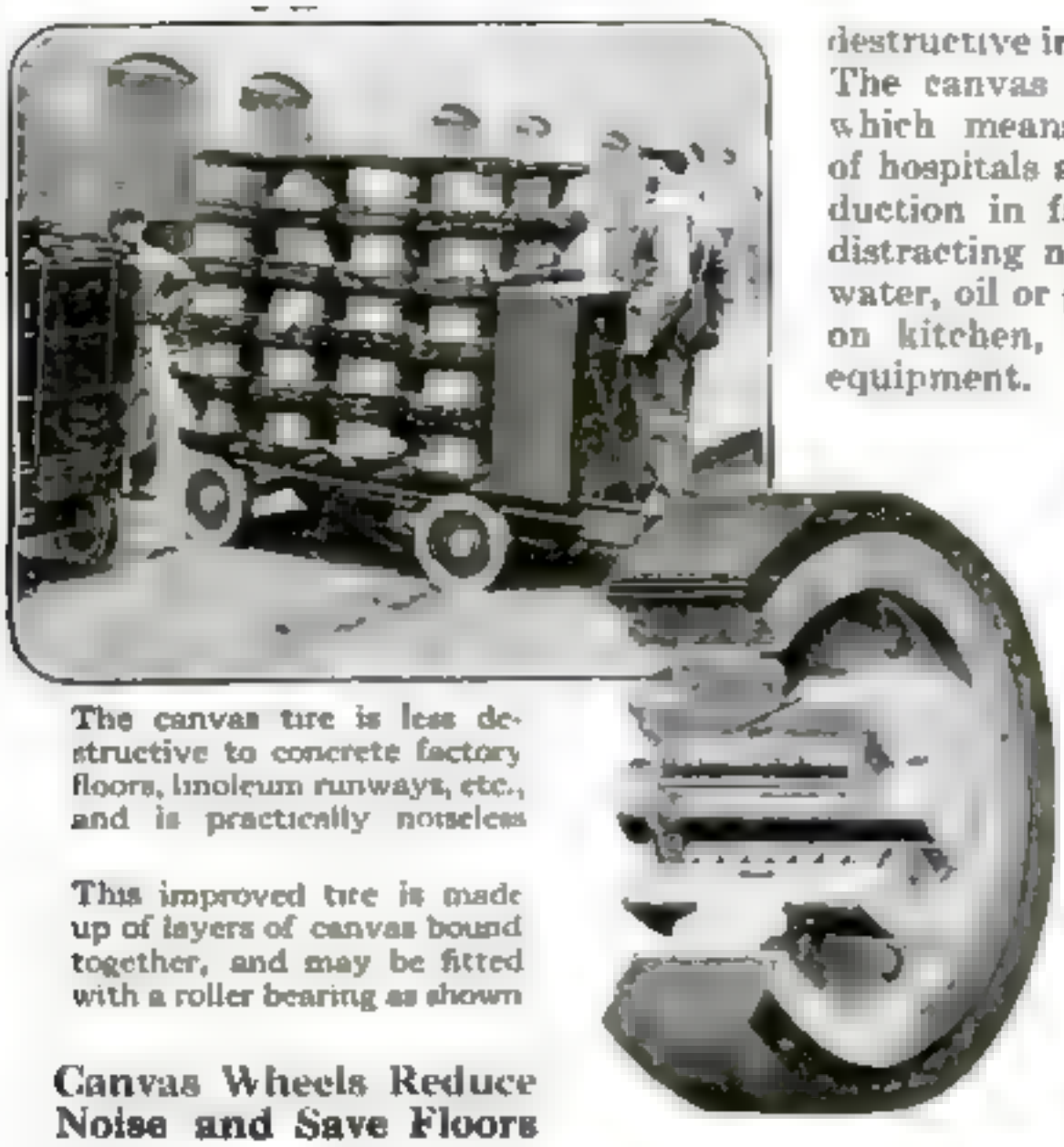
Them There Pesky Tobacco-Chewin' Bugs Ag'in

WHILE tobacco is recognized as a valuable insecticide which will kill most insects, there is at least one that lives in it and on it and thrives exceedingly far too exceedingly, to be pleasant.

This tobacco beetle, as he is called, is very epicurean in his tastes and prefers the better brands of tobacco. He is a native of Cuba and the Philippines, but has spread all over the world. He only lives in manufactured and stored tobacco, never in the growing plant.

There are several other insects that prey on the tobacco beetle, and his destructive larvae, but it is none the less necessary to control him by artificial means. Extremes of heat and cold will eradicate him, and fumigation with hydrocyanic acid or carbon bisulphide is also very effective in compassing his destruction.

The process of manufacture usually does away with both beetles and eggs, so that if protective measures are adopted their ravages can be more or less obviated. The smoker, therefore, has no well grounded reason to feel concerned regarding the possibility of finding the beetle in his cigar or cigarette. And the fact that the insect prefers expensive tobacco to the poorer grades may prove consoling to him who can afford only cheap "smokes."



The canvas tire is less destructive to concrete factory floors, linoleum runways, etc., and is practically noiseless

This improved tire is made up of layers of canvas bound together, and may be fitted with a roller bearing as shown

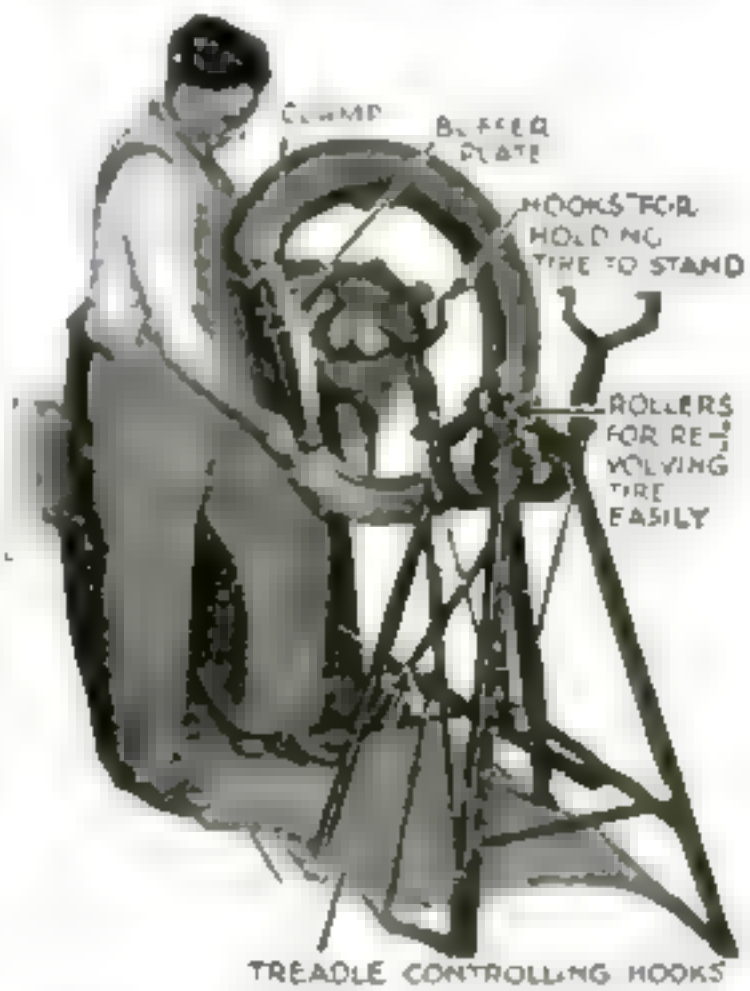
Canvas Wheels Reduce Noise and Save Floors

WE have steel tires, pneumatic tires and solid rubber tires, each with its place on some sort of vehicle, but the latest is a canvas tire designed for factory trucks, hand trucks, electric industrial vehicles and other portable objects such as hospital beds, operating tables, oil and gasoline tanks and a score of other devices. Less resilient and less costly than rubber, the canvas tire is far more resilient than iron or steel and of equal wearing qualities.

The canvas tire finds its greatest field on vehicles which are either slow or which do not travel far. It is far less destructive to concrete factory floors, linoleum runways, etc., than metal tires and does not wear away concrete and produce the fine dust which is so destructive in some forms of manufacture. The canvas tire is practically noiseless, which means greater comfort in cases of hospitals and the like and greater production in factories by the decrease of distracting noises. It is not affected by water, oil or grease and as a result is used on kitchen, laundry and packing-house equipment.

Tire Repairing Made Easy with a New Spreader

AN accessory designed to make easier and lighter the work of repairing automobile tires has recently been put on the market. It consists essentially of two parts—a buffer plate and a working stand on which the tire cover is held. The buffer plate, which is convex, is applied to the outside of the cover at the place where it is desired to make the repair, and is held in place by a clamp. Thus the cover is pulled back and the operator is able to reach the canvas. The cover is then placed on the stand, as shown in our illustration, with the buffer plate next the stand. It is held in place by two claws that engage the beads of the cover and hold it firmly. The stand has four small rollers on its saddle which can be raised to bear the weight of the cover, enabling it to be easily rotated for examination, or which can be retracted level with the saddle while the cover is being worked on. The machine weighs about sixty pounds. The fabric can be cleaned with a buffer wheel in a very short time, instead of by the old laborious method of scrubbing with gasoline.



The work of Automobile tire repairing is made easy with this machine

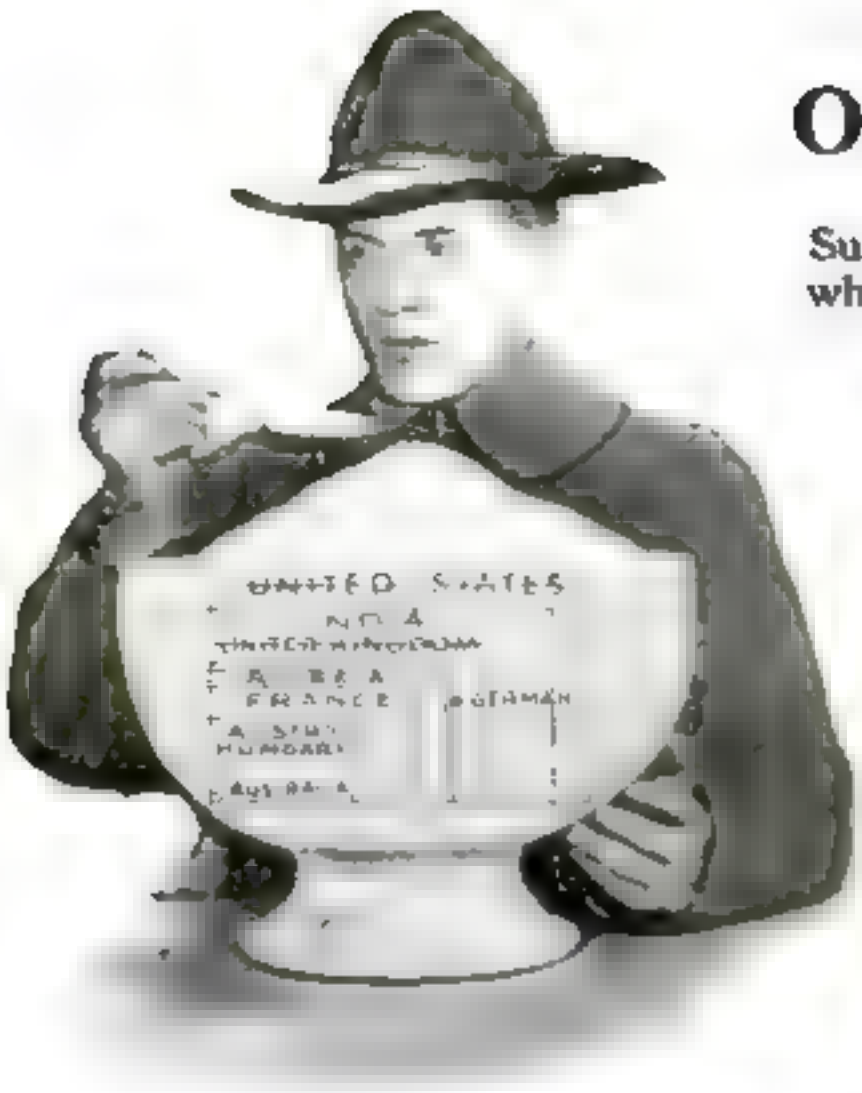
School Trains Women for Railroad Service

Some Wonderful Changes Wrought by the Draft

THE war has created in all belligerent countries a scarcity of male workers in occupations which heretofore have been considered unsuitable for women. Thousands of the young men employed in the shops and factories, the offices, yards and round houses of the various railroad lines of the country have been drafted into the army or navy and many thousands more are sure to be drafted if the war should continue for a long time. The railroads, being conducted upon a strict business basis, never employed more men than were absolutely necessary for maintaining the efficiency of the service. To prevent the service from being crippled, the vacancies must be filled with other efficient workers.

Realizing that the supply of available men is greatly limited, some of the large railroads took steps to train women to take the places of the men drafted into military service. Since many branches of the railroad service, like the telegraphic and telephonic service, the block-signal operating, etc., demand a certain amount of previous training and experience, some of the large railroad companies established schools for the systematic training of young women for these branches of service. The students are taught telegraphy and in six to eight months most of them develop into skilful and rapid senders and receivers of telegraphic messages. They are also instructed in the manner of controlling the block signal system by telegraph and telephone. The instruction is along practical lines and is aided by models of railroad tracks with block signals, switches, trains, etc.

Studying the movement of trains by means of realistic models. Below: Part of the room in which girls are preparing themselves to become railroad telegraphers and train operators



The diagram on the sugar-bowl represents the comparative total consumption of sugar of the eight countries mentioned

Our War Sugar Bowl

Sugar is a quick-action food, and that is why armies must have it to restore energy

By John Walker Harrington

SWEETS are the true food for fighting men, as sugar is almost instantly converted into heat and energy. It is pure fuel for the human furnace and it burns without ashes. Mosso, the distinguished Italian physiological chemist, through experiments in Naples many years ago, proved this with the ergograph, a contrivance which measures the fatigue that ensues when the hand is opened and shut, for example. He demonstrated that from three to five ounces of sugar eaten in the afternoon between the hours of five and seven o'clock restored the vitality which lags always at that period of the day and practically started the human machine going with the same force which it had in the early morning.

The German Army Fights with Sugar as Well as with Bullets

Germans, always on the alert to utilize the discoveries of science, have, in effect, claimed the work of Mosso as their own and put it into practical application at their army maneuvers. Soldiers under special rations of sugar withstood the hardship of forced marches much better than did those who had none or even a normal amount.

With the declaration of war, the amount of sugar consumed by each person in Germany rapidly increased, and the army got most of it. In the meantime, the vast beet fields of France and Belgium had been devastated, and the whole cane sugar trade which had been supplying Great Britain with such enormous quantities was much disturbed. Of the 18,000,000 tons of sugar which the world produces a little more than half is cane and the balance beet. In making estimates the sugar derived from the maple tree and other insignificant sources is not considered.

Australians Have the Sweetest Tooth of All

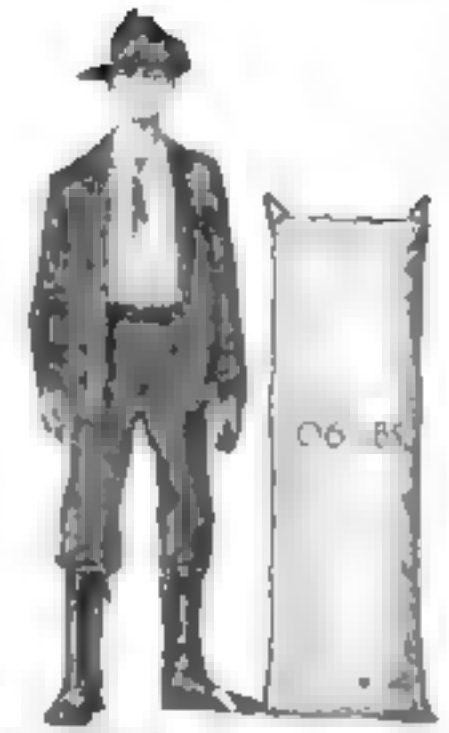
Although the United States is outstripped in both beet and cane growing by six nations, she leads in the world's sugar marts. We consume nearly 4,000,000 tons a year and each person eats an annual allowance of 86 pounds, according to the returns for 1917. Although the American sugar barrel demands the most, the American sugar bowl, that is, the amount eaten by each person, is not so large as in some countries. The less sugar a nation produces, the more, relatively, it is likely to eat. The Australians have the most eager sweet tooth, for each one of them in twelve months consumes 106 pounds.

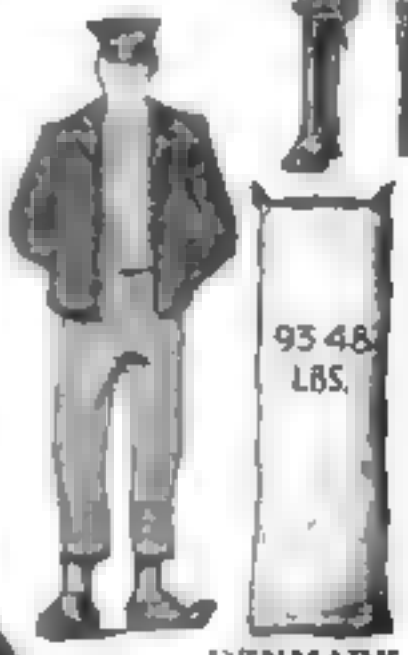
Denmark, which is small in population, suddenly rose to a per capita consumption of 93.48 pounds a year in 1914-15, an excess which perhaps her Teuton neighbors can explain. The United Kingdom, that is England, Ireland and Wales, is credited in that period with an annual per capita consumption of 89.49 pounds, while for the same season every American was eating sugar at the rate of 84.40 pounds a year. The Germans had been having before 1914 forty pounds a year each. Owing largely to needs of the army and also to the fact that the Teuton countries which had been ex-

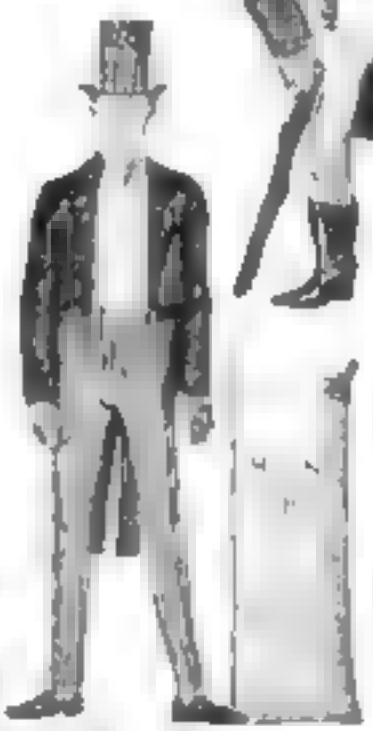
porting large quantities of sugar began to eat the surplus to make up for the deficiency of other foods, they soon reached a per capita consumption of 74.95 pounds.

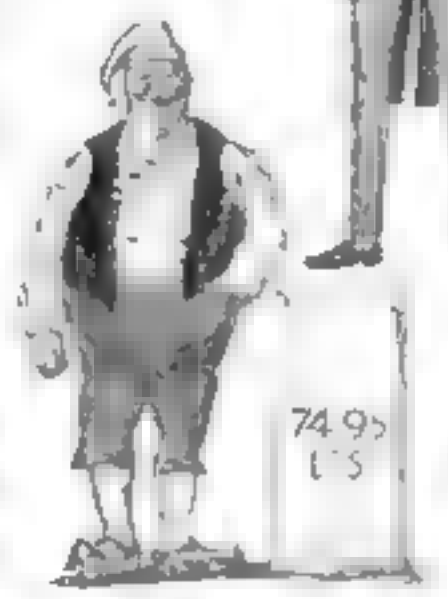
All these orders for quick-action food brought in sight the bottoms of sugar bowls and barrels all over the world. Germany is getting a very scant ration of sugar at present. The government of France has decreed that twelve pounds a year is quite enough for each of her inhabitants, and similarly the United Kingdom family supply has been cut to 36 pounds a year for each person.

These figures do not, however, include the amount of sugar which confectioners and bakers and manufacturers work into their products. The actual amount of sweetening which the French individual assimilated in 1917, judging from certain export figures, was probably 24 pounds, which was slightly less than normal. The best obtainable statistics indicate also that in the United Kingdom enough raw sugar was received to give every man, woman and child 62 pounds in 1917 as compared with the 77 pounds of refined sugar assimilated the previous year.









America Is Not Saving Much Sugar

Despite the cautions of the Food Administration, the consumption of sugar in the United States has not decreased very much, considering the fact that candies, desserts and various other edibles are being used more than sugar in the concentrated forms. The exportation of condensed milk and canned fruits has also somewhat augmented the American use of sugar. Another factor in the six pounds per capita increase in consumption in 1917 as compared with 1916 has been the curtailing of the liquor traffic. Even before the war, sugar was having an increasing vogue as a substitute for alcohol.

In some phases, the present sugar shortage is a blessing in disguise. The recent investigations of Professors Sherman and Swartz in the laboratories of Teachers College, Columbia University, show that we are inclined to eat more free or uncombined sugar than we should. Four to five ounces a day, which is about our present consumption in all forms, is considered a healthful ration. It is best to eat sugar in made dishes or conserves, so that it may be somewhat diluted and therefore more digestible.

Much sugar can be provided for our fighters, if we eat more sweet fruits and vegetables, as well as of that alluring though often cloying honey, which satisfied a saccharine craving long before the Crusaders brought from the Orient the magic crystal of the succulent cane. In addition to honey we have as sweeteners maple syrup and corn syrup, which will both answer many purposes for which we now use sugar, and often quite as satisfactorily.

The "Fulton Market" Hair Cut in Your Own Home

HAVE you ever heard of the "Fulton Market" hair cut? After the barber has trimmed your back hair as closely as he can with the shears, he strops his razor and proceeds to shave your neck, as if he suspected you of a desire to grow whiskers where they ought not to be. The result is so pleasing to the eye of the New York 'longshoreman and the Western cowpuncher that the shaved neck has its vogue among those who hold Fifth Avenue and its foppish ways in contempt. Even if you survive the loss of blood caused by incidental gashes you may be temporarily or permanently disfigured. The artistic success also is questionable.

No danger in shaving your neck with this well-contrived device

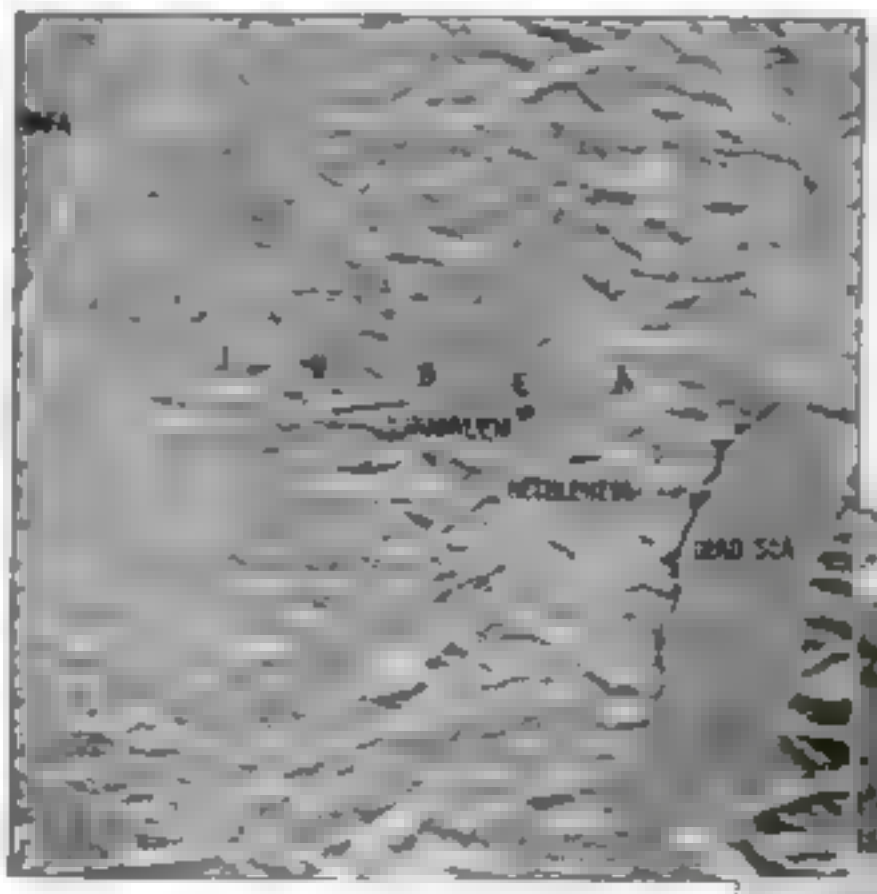
To supply the wants of neck-shavers, Mr. William C. Bridges of Muscatine, Ia., has invented a device to make shaving one's own neck a harmless operation. An adjustable band which encircles the head is connected by a curved and rigid finger extension with the guard proper. This protective part of the device consists of an adjustable arrangement of curved strips of metal or some other material, held together by pins moving in slots. To give the guard a firmer support it is supplied at its ends with ear rests covered with rubber sheaths.

A Maker of Relief Maps Who Has Few Competitors

THERE are only a few men in this country who devote their time to the making of relief maps. One of the most noted makers of such maps is Fred Burgie a French Swiss, who learned the art from his father, Professor Joseph Burgie, formerly a famous European maker of relief maps.

More than forty years ago, Prof Burgie, accompanied by his son, Fred, went to Palestine and made a careful survey of the Holy Land. He gathered valuable data concerning many points of importance in history and tradition and used them after his return, when he made a relief map of Palestine.

Fred Burgie followed in his father's footsteps and became the most renowned maker of relief maps in the United States. In his little shop in Rochester, N Y., he has made a large map of Palestine, now at Crystal Palace, London, and a smaller replica of that map for the National Museum in Washington.



Photograph of a section of the Palestine relief map modeled by Mr Burgie, for Crystal Palace, London

Fred Burgie at work on a map at his shop in Rochester N Y He is an expert in this work

Bacteria Cannot Live in the Light

IF we cover with black paper one-half of a petri dish (a small circular glass tray with cover) in which bacteria are growing and then place the dish in a light warm place for a few days, the growth of bacteria in the light part of the dish will be found to be checked, while growth continues in the covered part. It is a matter of common knowledge that disease germs thrive where dirt and darkness exist and are killed by any long exposure to sunlight. According to George W. Hunter's "Civic Biology" (American Book Company) this shows us the need of light in our homes, especially in our bedrooms.

© Western Newspaper Union.

This living emblem of the Marine Corps is formed of its bearers in their parade ground at Paris Island, S. C.

Underfeed Pipe That Loads from the Bottom

THE accumulation of moisture laden tobacco in the bottom of the bowl of the pipe is unknown in a style that is fed from the bottom. When more tobacco is to be put into the pipe, the bottom is removed, the new tobacco inserted from below, and the bottom replaced; consequently no part remains for days to soak up moisture and juices. The removal of the bottom also facilitates the cleaning of the pipe.

Whether or not one would appreciate the aroma of tobacco that would permeate his clothes as a result of carrying around the dottle in his pipe between smokes, is another matter.

Those who usually accumulate a lot of moisture in their pipes when smoking will find this new fangled pipe a great boon.

Section and method of loading the bottom-filling pipe

Two Thousand United States Marines Form Their Emblem

TWO thousand marines, quartered at the training station of the U. S. Marine Corps, at Paris Island, S. C., are shown in the accompanying picture grouped in such a way as to form the design of the service emblem of the Marine Corps, a globe showing the western hemisphere, an American eagle perched on top and an anchor crossing it. It is well to remember the fact, that in the emblem North and South America are visible on the surface of the globe. Otherwise it would be rather difficult correctly to interpret the meaning of the dark spot within the circle representing the globe.

The novel grouping of masses for pictorial effect is not an easy matter and it must have required a great deal of patience to obtain the strikingly good effect shown by the photograph, which was taken on the parade grounds of the training station.

What a $50 Liberty Bond Will Buy

The War Department spends $4 875,000 a month to turn out rifles of the type which this soldier is holding ready for the attack

Here's another use for Liberty Bond money. Gas masks, like that shown in this photograph, cost $339,000 for the men of one division of infantry. But that's only one item of one nation. Almost a dozen cities larger than New York could be bought with the money spent on the war by the various governments.

Look at these articles of wearing apparel and then read this: The expense of clothing a million and a half American troops totalled $62,265,000. If this information startles you, bear in mind that at one period Germany was paying out $700,000,000 monthly, in various ways, for the war.

What a $50 Liberty Bond Will Buy

Steel helmets can be supplied to one division for $84,000. Helmets of the type pictured here will save the American troops from death or wounds The rifle recalls the words of General Percin of France, who said, basing his statement on the cost of the war to his country up to January 31, 1917, that it cost $32 000 to kill a man

To equip three brigades with the kind of shoes worn by this defender of the nation means an outlay of $285,600. The cost of each pair is $5 10 and it takes nine pairs a year per American soldier abroad, allowing for consumption and proper reserve supplies. So less than a $50 Liberty bond will keep a man shod for twelve months

Giant Cars to Help in Solving the Coal Problem

ONE of the reasons given for the coal shortage during the past winter was the lack of transportation facilities.

The coal-carrying railroads of the country have tried for some time to solve this serious problem by substituting larger cars for the old style coal cars of limited capacity. One of the southern railroads is now trying out several gigantic coal cars, which hold the record as the largest of their kind in the world. The average coal car in use on the different railroad lines has a capacity of sixty tons, while the new cars, one of which is shown in the illustration, has a capacity of 120 tons. The new cars, which differ materially in their construction from the old style cars, are only fifty feet long, that is fifteen feet longer than the average coal car of steel construction. The greater capacity has been attained by increasing the length of the car and also its depth. The center sill running lengthwise through the car acts only as the medium for transmitting the pulling and buffing stresses, while the side framework resting upon the trucks carries the load. To obtain a better distribution of the weight, six-wheel trucks are used instead of the usual four-wheel trucks.

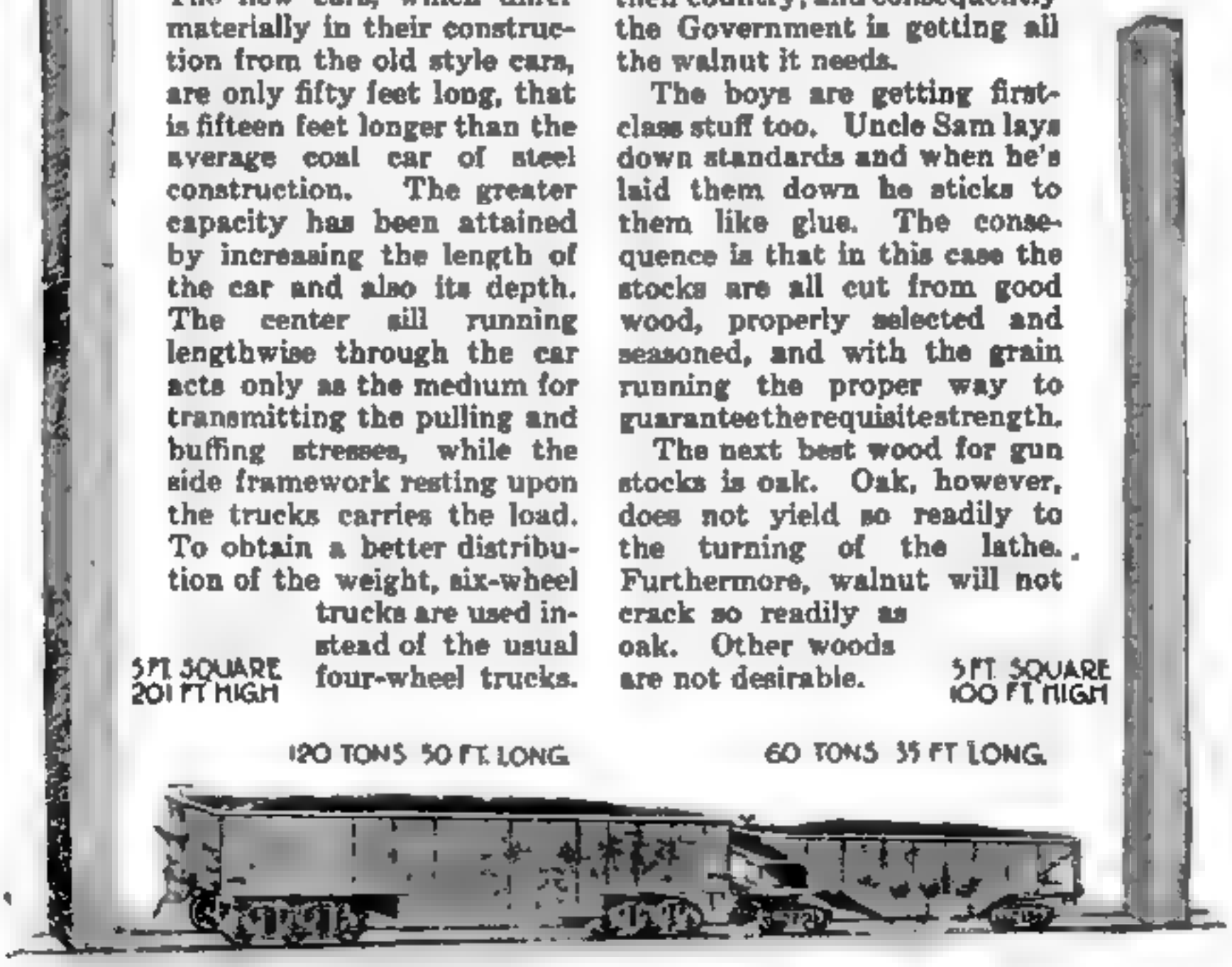
If You Own a Walnut Tree These Days You're in Luck

WALNUT, walnut, walnut. That is what your Uncle Sam is looking for just at present. What does he want it for? Why gunstocks. Walnut is and always has been the wood *par excellence* for the manufacture of stocks. It is easy to work, will not easily crack, and will not splinter.

In spite of the enormous demand which has always existed, and exists now more than ever, there is any amount of the wood to be got, so long as you are willing to pay the price. The reason for this is that in the timber countries, as they have become more and more settled, the inhabitants have sought to beautify their land and homes, and consequently, lacking the urging of necessity, have absolutely refused to sell their trees at any price. Now, under the spirit of patriotism, people are sacrificing these grand old landmarks to the service of their country, and consequently the Government is getting all the walnut it needs.

The boys are getting first-class stuff too. Uncle Sam lays down standards and when he's laid them down he sticks to them like glue. The consequence is that in this case the stocks are all cut from good wood, properly selected and seasoned, and with the grain running the proper way to guarantee the requisite strength.

The next best wood for gun stocks is oak. Oak, however, does not yield so readily to the turning of the lathe. Furthermore, walnut will not crack so readily as oak. Other woods are not desirable.



This new car is only fifteen feet longer than the average coal car but has a capacity of one hundred and twenty tons. It should help solve the serious transportation problem

Carelessness and What It Means in Forest Fires

DURING the year 1917 our National forests were devastated by 7,814 forest fires. According to the report of the Forest Service of the Department of Agriculture all these destructive fires, with the exception of 2,132, which were caused by lightning, could have been prevented; 952 were undoubtedly incendiary fires, while the rest were due to pure carelessness of campers, hunters, railroads, settlers or travelers.

Applying the Fireless Cooker Principle to the Delivery Wagon

EVERYONE, nowadays, knows the principle of the fireless cooker. Interpose a sufficient layer of insulating material between the atmosphere and the food which is to be kept hot and you reduce the amount of heat radiated. The principle is also applied in keeping chilled food cold. The insulating material used is mixed wool, asbestos, or even hay.

The same principle has now been successfully applied to delivery trucks and packing boxes. One of the large express companies has been making experiments this winter in St. Paul, where the temperature was way below zero. Cut flowers, and other very delicate goods, were loaded directly from trains into these cold-proof boxes, and preserved until they could be delivered, in spite of the severe cold. Motor-trucks and wagons were also successfully equipped in this manner, insulated with paper, canvas and felt.

These delivery wagons are made on the fireless cooker principle, with non-conducting walls, bottoms and roofs

This model "patient" is for the training of dental students at Iowa

Dental Practice on Teeth That Never Ache

BEFORE dental students are permitted to practice upon patients in the clinic they must undergo a thorough training in the science and technique of dentistry at their college. In order to give a dental student the experience of working upon a model closely resembling human jaws and under conditions such as would confront him in his work at the clinic, Dr. F. H. Volland of Iowa City, Ia., has invented the device shown in the accompanying illustration.

The model jaws, with bone teeth imbedded in the gums, are fastened to an adjustable arm supported by a pedestal. These jaws may be placed in any position which the jaws of a patient in the dental chair might possibly assume. Not until the student has learned the technique of filling teeth, capping or crowning them and doing bridge work on this model will he be permitted to try his skill upon the patients in the clinic. The University of Iowa uses the model with success.

Conveniences and Novelties in Office Equipment

A new and distinctive article for the desk of the office man is the plate glass tray, the parts of which are held together with nickeled clamps

A combined adding and recording machine with movable carriage and rack attached to indicate the position of the carriage

An inkwell that tilts forward and has an automatic closing device that prevents the fluid from evaporating

An attached clip enables the pencil to be easily carried and the cap embodies a serviceable sharpener

A railroad office has this revolving table installed in one of its offices to speed up the sorting

The hand-operated envelope sealer shown below will seal fifty envelopes per minute

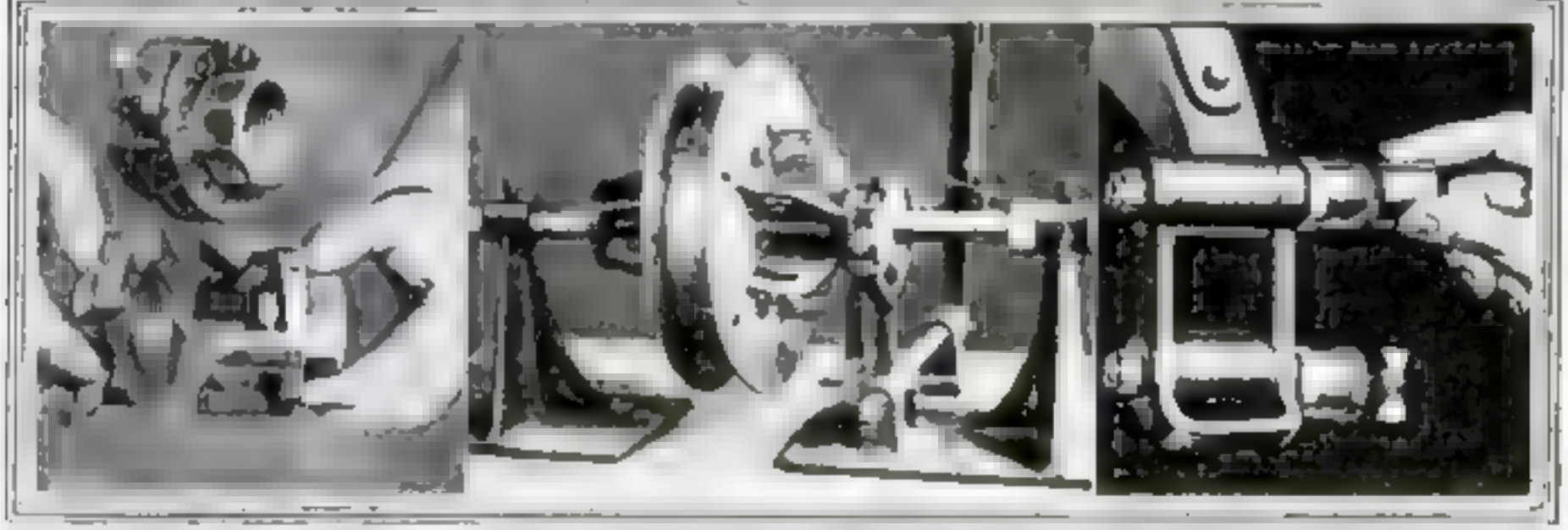
An electrically heated device that drops wax and seals packages at a much more rapid rate than by methods formerly employed

A knock-down chair that is fastened together by means of metal bolts and clips at the joints

Do It with Tools and Machines and Save Time and Muscle

At the left, a two-part heat-treated steel shell shaped like a truncated cone for dressing valves

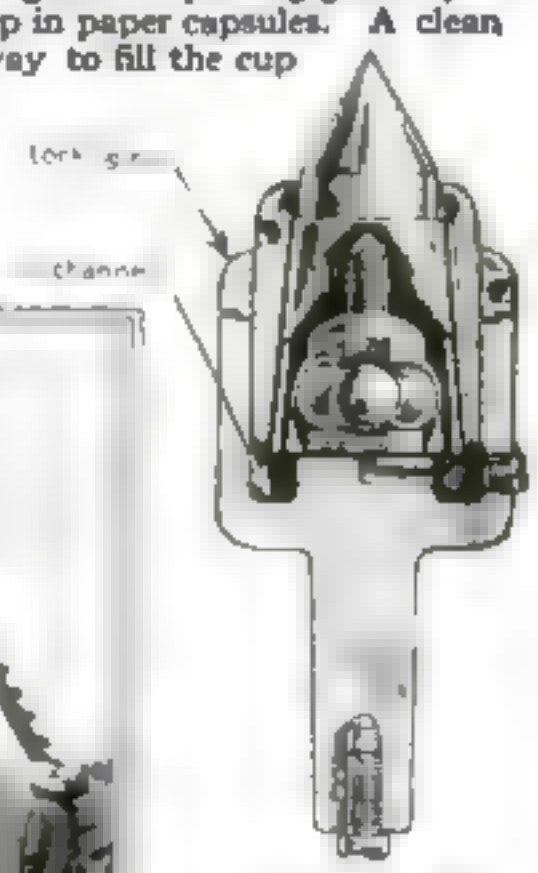
A small electrically-driven bench planer is at the right. It is adapted to home or workshop use



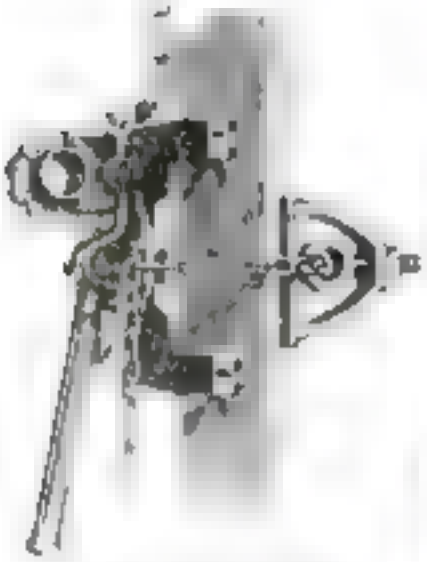
A boltless flange union for pipe lines, which draws the parts together by rotation

Increasing or diminishing the diameter of the pulley over which a flat belt runs by moving the vanes in or out to change speed of the shaft

A grease cup using grease put up in paper capsules. A clean way to fill the cup



Below is shown a novel machine designed by a farmer to pile stumps for burning in land-clearing operations



A portable chain grip vise which can be fastened quickly to any kind of horizontal or vertical support. It can be used in various ways

A ball bearing lathe center designed especially for lathe used by metal spinners or wood turners

© Int. Film Serv.

This mass of debris is the result of a huge chimney crashing through factory roof

Chimney Crashes Through Three Floors of a Factory

WEAKENED by a terrific gale, a three by four-foot brick chimney towering above the roof of a box factory at Lynn, Mass., suddenly fell and crashed through three floors of the building, killing three of the employees and injuring others. Several persons were carried down with the falling brick and timber to the floors below. Others sitting quietly at work suddenly saw a great hole open before their eyes, into which their companions and machines vanished.

There were many narrow escapes from injury and death, and amid the excitement women had to be restrained from jumping from windows. Firemen, police and physicians came promptly to the scene and did heroic work. It was fortunate that no fire occured, since the stiff gale from the harbor would have spread the flames rapidly.

One of the suggestions resulting from the catastrophe is that there should be a physicians' call sounded through the fire-alarm system in an emergency of this character. A pre-arranged signal, it is thought, would bring a corps of doctors quickly to the scene and hasten the rescue and relief work.

This is really a most serious question. Everybody has read of the dreadful holocausts that happen every now and then in different parts of the country. How often it goes like this: "Several physicians were soon on the spot and worked heroically at their work of mercy until far into the night. It was pitiful to hear the groans of the injured who could not be aided immediately owing to the few doctors who were available to carry on the work."

Are You Stifling Your Feet? Let Them Breathe

SUPPLY air to the feet and foot ills would vanish is the belief of a New Jersey manufacturing company. To prove its point it has introduced a little device to ventilate your shoes. The device was invented by Mr. E. J. Devlin of Newark, and consists of a little perforated button which is made so that it will clip into a hole in the instep of the shoe like an eyelet. Into this screws a plug with a hole through the middle. By adjusting the plug a greater or less quantity of air can be admitted, but at the same time water and dust are excluded. Air is drawn in and expelled at every step. The exterior portions of the device are colored to match the shoe.

Air expelled through this shoe ventilator blows out lighted match

Highways and Automobiles in Warfare

IN discussing the importance of good highways and of automobiles in modern warfare, Major Amos A. Fries, Corps of Engineers, U. S. Army, brought out some interesting facts. Basing his statements upon the experiences of the French military authorities, he expresses the belief that in case of an emergency it would be possible within a few days to get together 200,000 automobiles, which would be able to carry 600,000 to 800,000 men with their equipment and rations to any desired place.

Not particularly comfortable for the patient, but it will at least take him to the hospital with very desirable speed

Locking Gear Lever in Neutral Position to Prevent Theft

ONE of the latest of the locking devices which is to be attached to an automobile, which will prevent the car from being run under its own power but which will not prevent its being stolen by the towing method, consists of a small lever-type lock inserted in the ball-ended handle of the gear-shifting lever. A key inserted in the lock operates a small rod extending down through the hollow lever to the base. The turning of the key in the lock trips a small lug on the upper end of the rod so as to rotate the rod slightly and cause a similar lug on the bottom to slip into a notch and lock the gear-changing mechanism in a neutral position. As we said above, this does not prevent a car from being towed away by a thief.

Gear-shift lever locked in neutral, preventing car being stolen

A Queer Improvised Ambulance In Use in France

IN addition to the large number of regular ambulances, constructed for that purpose, which are in use behind the West Front in Flanders, there are many that were improvised with more or less success from vehicles of every kind. The accompanying picture shows one of these ambulances, improvised from an automobile of the coupé style.

The bed intended to receive the patient is placed immediately behind the cab of the coupé and rests upon the box containing the gasoline tank. A trip in this ambulance is probably rather hard on the patient, but in emergency cases the conveyance may do excellent service, especially if the roads are not in too bad a condition. At any rate, men suffering from wounded limbs could be transported.

Wind, Weather and the Airman

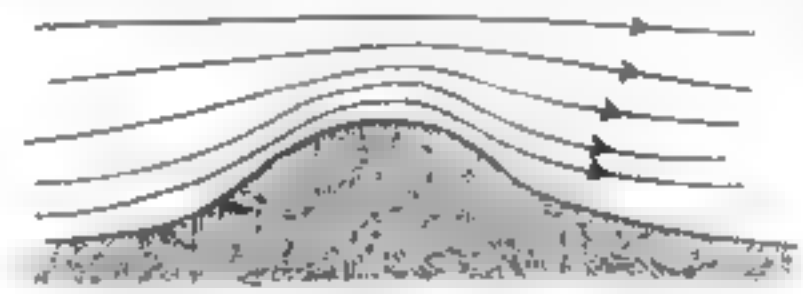
The Invisible Perils of the Whirlpools, Gusts, and Eddies of the Ocean in which Men Fly

AIR navigation, in its relation to weather, is repeating the history of marine navigation. The slow sailing-ships of early days were the sport of wind and waves; the great ocean liner of today pursues the even tenor of its way regardless of the elements. Under the urge of necessity the military aviator now flies in all kinds of weather, and his high-powered machine negotiates atmospheric difficulties that would have been insuperable a few years ago. Nevertheless, even the biggest ocean liners sometimes come to grief, and the day is still distant when the aviator will not need to keep his weather-eye wide open.

Airships and airplanes are the submarines of the atmosphere, but the element in which they ply is far more fickle than the ocean. The currents of the latter are comparatively feeble and regular; those of the former are often immensely powerful and capricious.

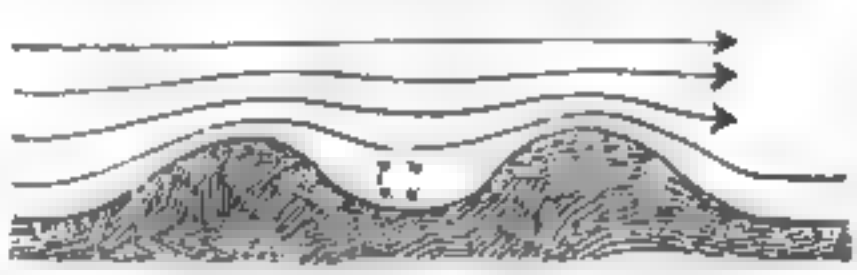
There Are Winds and Winds

An aviator studying the atmosphere learns much of interest. The structure of the atmosphere with respect to wind is a subject concerning which a great fund of knowledge has recently been acquired through the practical experience of aeronauts on the one hand, and the scientific investigations of meteorologists on the other. The mariner dreads a strong wind; the aeronaut an unsteady one. Mere strength of wind is harmless to the aviator, except in starting and landing, and, indirectly, owing to its ability to drive the airplane far out of its intended course. If the strongest hurricane that ever blew were perfectly steady, the airman might well be as indifferent to its speed as the average mortal is to the speed with which our terrestrial globe rotates on its axis. But unfortunately the wind is hardly ever steady, either in force or direction. It is full of gusts and eddies, up-currents and down-currents, and it is these eccentricities which gradually develop in the aviator a sort of sixth sense, a "feel" for atmospheric fluctuations, that enables him to adjust his machine instinctively to the forces tending to disturb its equilibrium. He also learns by experience the conditions under which irregularities of a pronounced character may be expected. He becomes well acquainted with the great mound of air that drives the airplane upward in passing over a hill or mountain; with



Flow of Air Over a Ridge

Notice that the crest of the air wave lies a little beyond the crest of the ridge. This does not apply to isolated hills, which the air easily passes around



Flow of Air Over Two Ridges

Notice the eddy in the valley to the leeward of the first ridge. In this case the crest of the air wave still lies beyond the crest of the ridge, as seen above

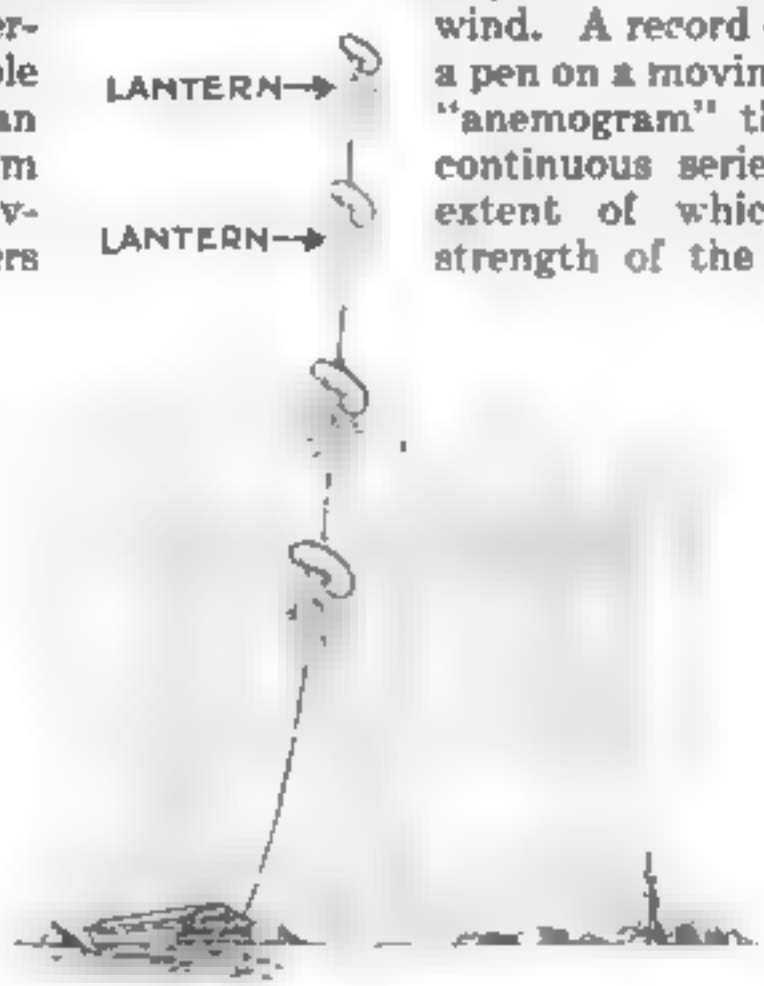
A "Sheltered" Landing-Place May Be Dangerous

A landing-place surrounded by trees is dangerous in windy weather on account of the air waves between the moving air above and the calm air below

Waves and Gusts in the Air

The illustration shows how these are made visible by smoke. The reader will be able to observe this phenomenon for himself almost any windy day

the eddy that lurks in the lee of such an obstacle; with the downward tendency of the air over lakes, rivers, swamps and forests. "The air is so sensitive," said Mr. Gustav Hamel, the famous flyer, "that it is affected even by the color of large patches of vegetation. Whether this be entirely due to the different heat-radiating power of different colors, it is impossible to say, but invariably an aeroplane on passing from grass land to a field covered with yellow flowers experiences a certain amount of air disturbance only less noticeable than the inevitable bump experienced in passing from green fields to ploughed land or from ploughed land to meadow."



A Solution of the Fog Problem

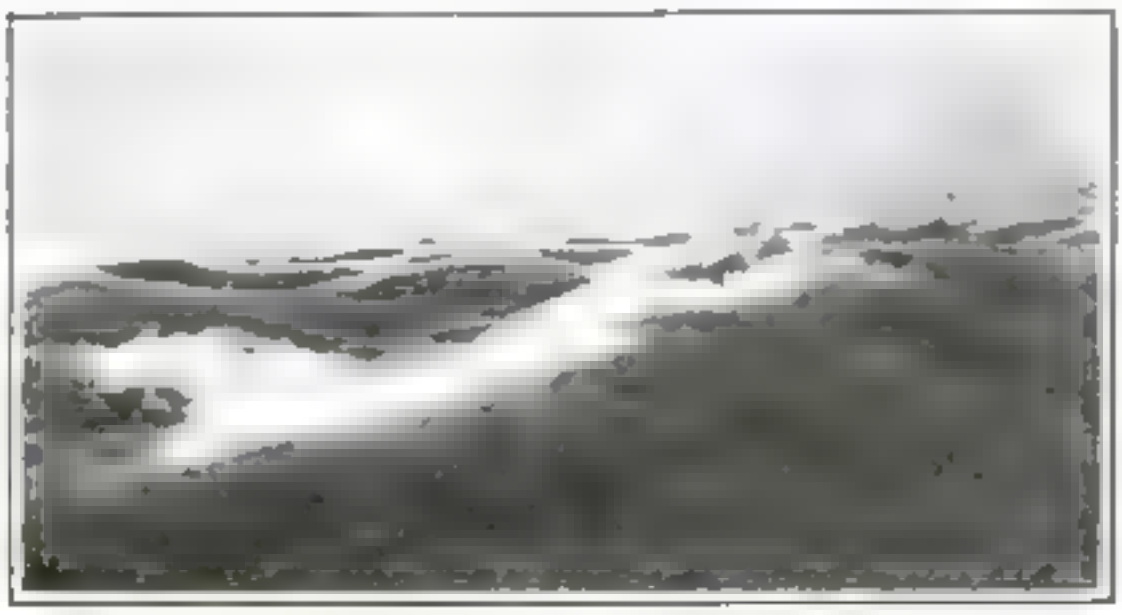
Along the main flying routes landing-grounds will be established at intervals of ten miles. Their location will be marked by illuminated kite-balloons

When the wind is blowing, the air for at least a few hundred feet above the ground is nearly always in a state of turmoil. This is partly due to friction of the moving fluid against the irregular surface of the earth, and partly to the ascending and descending currents caused by differences in temperature. The latter effect is illustrated in the rapid rise of air over a bare plain, by day, and its fall over an adjacent forest or body of water. A good picture of the atmospheric ups-and-downs and other disturbances encountered by the airman when flying low is furnished by the behavior of the smoke from a factory chimney with a moderate wind blowing, forming smoke-waves.

The Autograph of a Gust

These disturbances give rise to the very marked fluctuations in the force of the wind known as *gusts*. There are certain forms of anemometer especially designed to record the gustiness of the wind. A record of its force is traced by a pen on a moving strip of paper, and the "anemogram" thus obtained shows a continuous series of irregularities, the extent of which increases with the strength of the wind. The puffs and lulls often alternate at intervals of a few seconds or less, and the actual strength of the wind at a given instant may be many times greater than its average force for, say, five minutes.

The turbulence of the lower air extends to various heights, depending upon the strength of the wind. A rough rule, evolved by Zeppelin pilots before the war, was to expect turbulent conditions up to an altitude equal to from 10 to 20 times the force of the wind in meters per second. Thus, for a wind of 10 meters per second, the turbulent layer would be from 100 to 200 meters deep, and so on accordingly. With increased altitude the wind generally increases in both strength and steadiness, but sometimes very unsteady air is encountered even at great heights. This brings us to the important subject of air-layers, or broad streams of air



Clouds Seen from Above

Aeronauts, looking down on the wind-swept surface of the clouds have observed their surfaces to be thrown into a series of rolls of vapor, which are vast waves of air with crests half a mile apart

Air Waves Far Above the Earth

With the right conditions of temperature and humidity these waves are made visible by the formation of little clouds whose crests are marked as furrows. These are called *cirrus*, and are the light, fleecy summer clouds

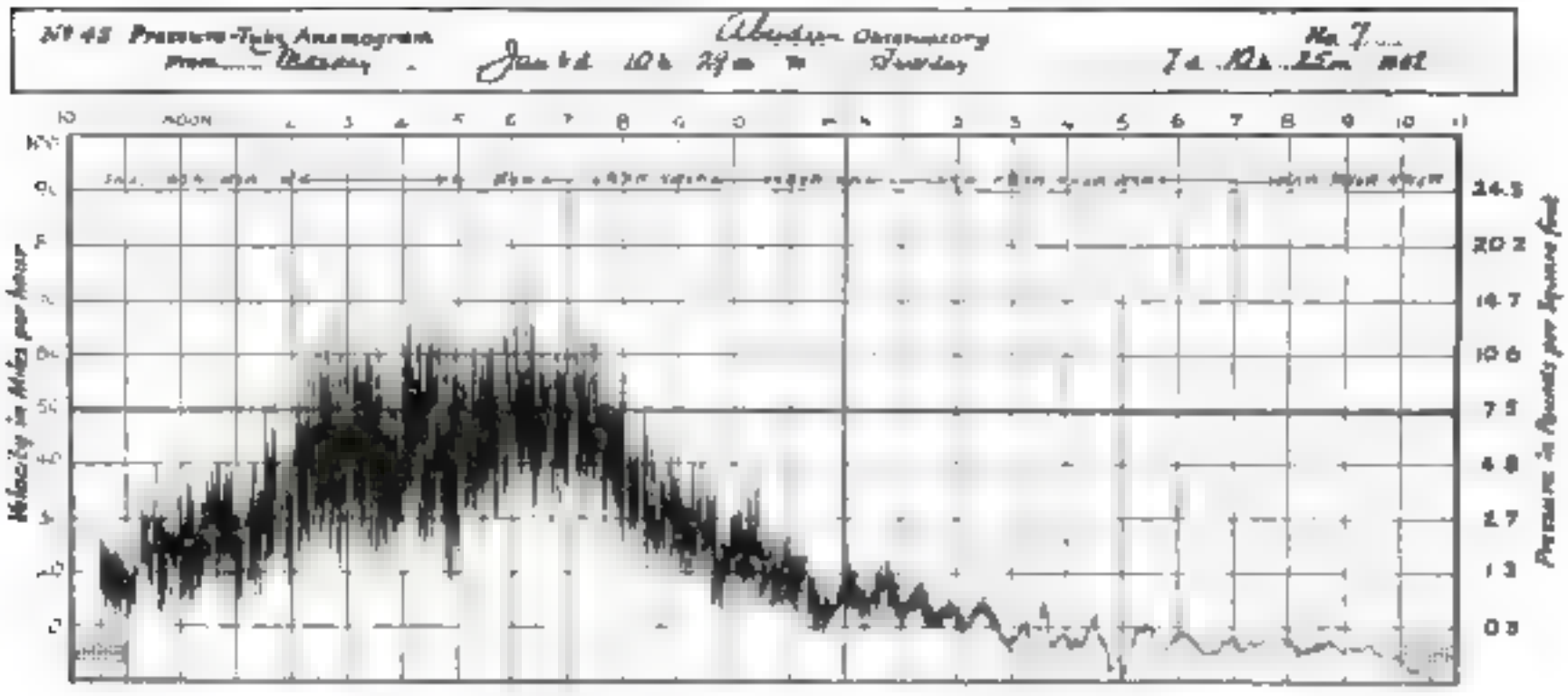
of different temperatures and humidities, which glide over each other without much intermingling. At the boundary surface between them, friction sets up waves like those produced in water by wind flowing over it. When the two streams are moving in the same direction the waves are long and regular; when they are more or less crossed, the waves are short and choppy. The moisture at the crests or furrows of these waves may be cooled to such an extent as to condense into visible clouds, arranged in long continuous rolls or successive rows of detached patches; but more often the waves are entirely invisible.

Ascending and descending currents in the air are also sometimes made visible by the larger detached clouds of the type known as *cumulus*. Each of these clouds marks the summit of an ascending column of moist air, while in the spaces between them the air is generally sinking. The upflowing air under a cumulus cloud may attain a vertical speed of 25 or 30 feet a second, while the descending current between clouds is sometimes so strong that an airplane cannot force its way up through it. The most violent vertical movements are encountered in thunderstorms. The term "hole in the air" describes a sudden downward tendency of the airplane, whether due to running into a descending current or to encountering a sudden change in wind velocity and consequent lifting force.

There has been much talk about "charting" the winds for the aviator—a project implying the assumption that the currents in the atmosphere are as regular and as constant in their location as those of the ocean, which is far from being the case. Even the most constant winds in the world—the trade winds—are subject to great fluctuations in force. What the aviator really needs to know is the typical behavior of the winds with respect to the distribution of barometric pressure at a given time (as shown on a daily weather map), and how they are likely to be affected by the topography of the country over which he is flying.

Fog—the Airman's Dread

One of the most serious weather problems of the aviator is presented by fog. When flying above a fog (and the same is true of low-lying clouds) the airman has no landmarks to guide him. His compass is almost useless, because, while it tells him which way the head of his machine is pointed, he has no means of knowing how much he is being drifted out of his course by the wind. In a long flight his "leeway" may carry him scores or hundreds of miles wide of his objective point. Fog also presents a grave danger when he is landing, as he knows neither his distance from the



The Wind's Autograph on a Gusty Day

Recorded with a pressure-tube anemometer. The vertical lines are hour-lines and the horizontal lines show the force of the wind in miles an hour and also in pounds a square foot. Direction is also indicated

ground nor the character of the latter. Many a forced landing in foggy weather has ended disastrously in the ocean.

The fog problem will undoubtedly be solved. Probably the radio-compass or some other system of wireless signalling will help the airman keep his bearings, and he will obtain further guidance from aerial buoys, in the shape of captive balloons, floating above the level of all ordinary fogs. Mr. Holt Thomas, in England, has recently proposed the plan of establishing landing grounds at intervals of a few miles along the main air routes, their location to be marked with kite-balloons by day and powerful searchlights by night. A better plan would be to fly at each landing place, and wherever else aerial signposts were desired, a string of kite-balloons flying tandem, with a lantern suspended from each balloon. It would thus be possible to attain much greater altitudes than with a single balloon and a searchlight, and hence to provide for fogs of all depths.

Little need be said about the other weather factors in aviation, because they are hardly more serious in their effects than the corresponding conditions of travel on *terra firma*. At great altitudes the air is very cold, in summer as well as winter. The carbureter must be shielded against freezing, and the aviator needs the warmest clothing. The airman also needs protection against rain and hail—the pelting of which, when one is flying at one hundred miles an hour or more, is uncomfortable, to say the least. Lightning, which is a serious hazard in ballooning, seems to be relatively harmless to the airman. Deposits of ice and snow, besides loading the planes, may hamper the working gear of the machine, though aviators have reported few cases of this kind.

Last, but not least, in the coming age of commercial aviation the weather bureau now maintained by the governments of all civilized countries will enlarge the scope of their activities so as to safeguard air traffic against atmospheric dangers; while the science of weather will, in turn, derive great benefit from the collective wisdom of practical airmen.

A Thousand Dentists Will Be in the United States Army

DENTISTS are just beginning to come into their own in the Army. Even yet their importance is insufficiently recognized. According to the latest reports we are to have only one dentist to every thousand men. Yet there are to be eight horseshoers to every hundred horses. For the two hundred and fifty thousand horses which the government will need, there will twenty thousand horseshoers, while for one million men there will be provided only a thousand dentists.

Maybe you have special needs. Write to the editor about anything within the scope of the magazine. He will be glad to help you.

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Ringing the bells of St Paul's Cathedral, in London, in honor of the great Allied victory at Cambrai

Ringing Out the Victory of Cambrai from the Great Bells of St. Paul's

NOT every one can ring the great bells in church towers. It takes skill and it takes strength. In the accompanying illustration we see the bell ringers of St. Paul's, London, preparing to ring joy bells in honor of the successful Cambrai offensive.

The upward swing of the bells is so strong that the ringers are very often pulled off their feet. On the rebound, each man lands on a small, flat cushion in front of him, by which his fall is broken. The small loops to be seen on the boxes are foot braces.

According to an old English custom, no bell ringer may wear a hat while at his work. Judging by the expressions on the faces of the men here photographed, they would uncover without any aid from precedent, for they are bringing to the occasion a deep solemnity, conscious of the cost of victory.

Campanology is one of the most interesting and most intricate arts practised. Change-ringing is exceedingly difficult and very exhausting.

When Is a Feather Not a Feather? When It's a Hair

OUR picture shows several midground types of feathers in course of evolution. They are midway between scales and feathers.

Crossing in the center are two hairlike forms called "filoplumes." Sloping up to the right is one found in abundance on poultry. It is practically a true hair with its tip divided into several slender prongs, some of which have a suggestion of feather-down near their bases. The one crossing it, noticeably more plumose, is from an owl.

The form to the right with the many pointed black tip is from one of the very rare toucans. It is from midway on the neck and shows an intermediate stage between the true feathers on the back and the scalelike forms topping the head where the feathers have changed wholly into thin, horny plates or scales, seen at top of picture. Barely enough feather-down remains to suggest its origin.

To the left side of the picture is a unique intermediate stage between feather and scale—strongly suggesting a fish scale. This would be the normal trend of evolution owing to the aquatic life of the penguin from whose wing this was taken. So nearly midway between scale and feather, it claims both names and is called *squamipennis*—scale-feather.

The throat of the humming bird supplies the form at bottom. These are true feathers and take their name not from any mimetic form of structure, but from their collective appearance which is strikingly scalelike. They are called *squama*.

It is such transitory stages as this, observed repeatedly, that lend color to the evolution theory.—C. B. DAVIS.

Various peculiar types of feathers in the process of becoming scales

Cooking Your Meals While You Drive

Using the exhaust heat of your engine to prepare luncheon while running at twenty-five miles an hour

By Albert Marple

THE manifold stove is new. It fits beneath the hood over the exhaust manifold of the automobile engine and may be used for baking potatoes, heating canned goods, and water. The device costs only about a dollar to manufacture, uses heat that would otherwise be wasted and is a valuable time saver. It was invented by J. I. Wernette, of Glendale, California.

This stove is about ten inches square at the top and is fourteen inches deep. A hole cut in its side permits it to fit snugly over the manifold, and a wire netting is so arranged as to keep the pans, canned goods, etc., from touching the pipe. For baking potatoes, a baking pan, sufficiently large to fit tightly within the stove, has been provided. When warming up canned goods the cans are placed directly upon the wire netting. An especially prepared can permits the motorist to make coffee or boil water for tea.

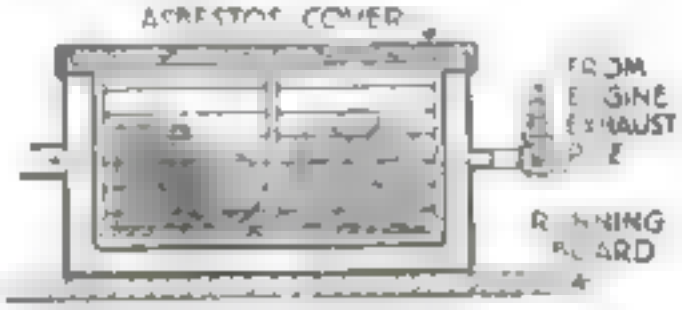
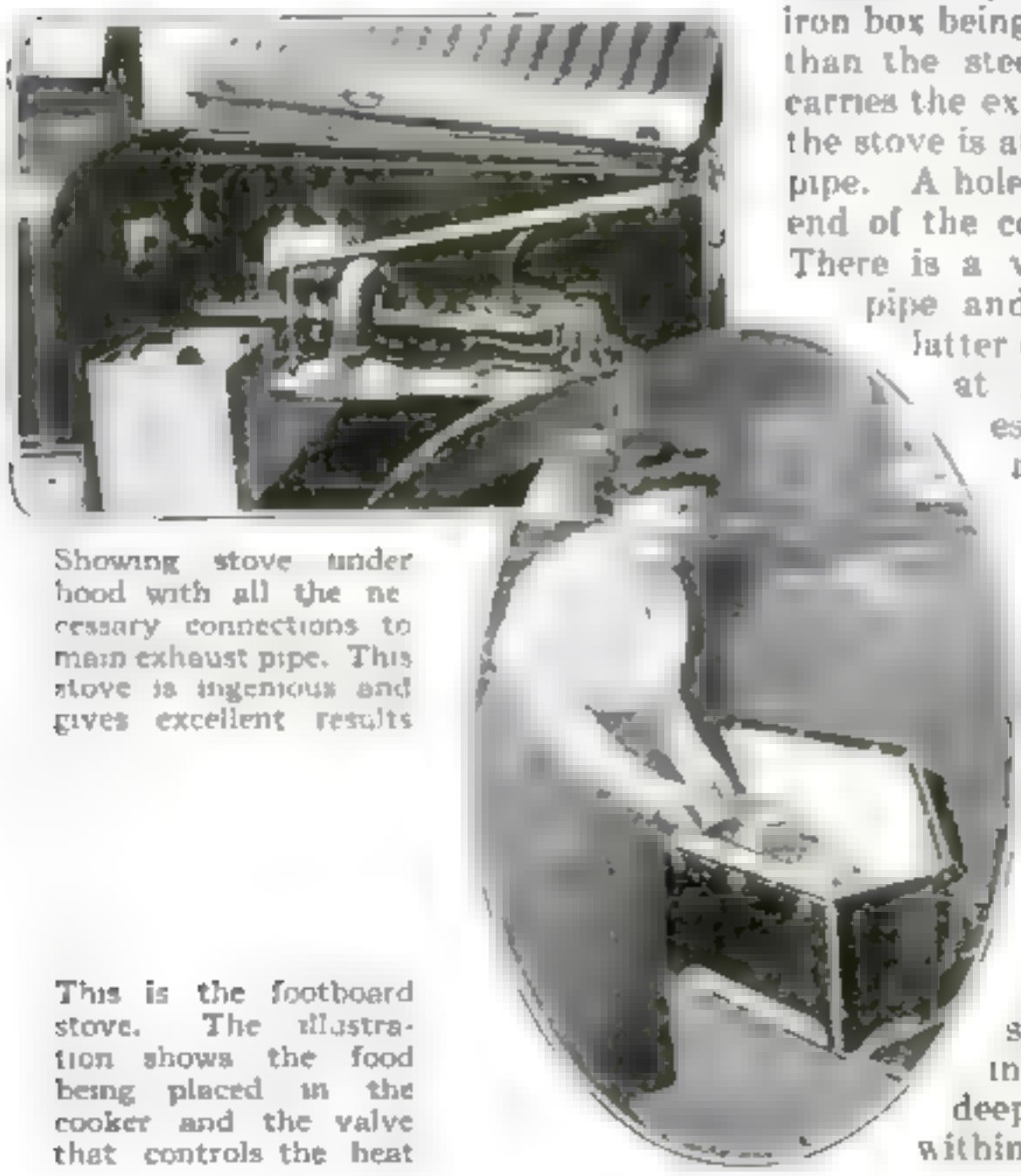


Diagram showing construction of above and disposition of the food

Another type of stove, heated by the exhaust, is located on the runningboard. This new stove is a large steel box, around the inside of which is a heating space, about one inch wide at the two sides, ends and the bottom. To provide the space a sheet-iron box is soldered in place within the steel box, the iron box being one inch smaller all around than the steel stove. The pipe which carries the exhaust gases to and through the stove is attached to the main exhaust pipe. A hole is made in the pipe and the end of the cooker pipe clamped over it. There is a valve between the exhaust pipe and the cooker so that the latter can be disconnected or used at full capacity. The gases escape eventually through an auxiliary exhaust pipe. Removable wire shelves are placed within the stove whenever it is desired to cook potatoes or apples. So efficient is this cooker that a large fish, a rabbit or quail may be cooked to a turn while the car is traveling a distance of fifty miles. Potatoes or apples may be baked in a distance of from fifteen to twenty miles. This box or stove is two feet long, ten inches wide and twelve inches deep. An asbestos pad arranged within the lid retains the heat.



Showing stove under hood with all the necessary connections to main exhaust pipe. This stove is ingenious and gives excellent results

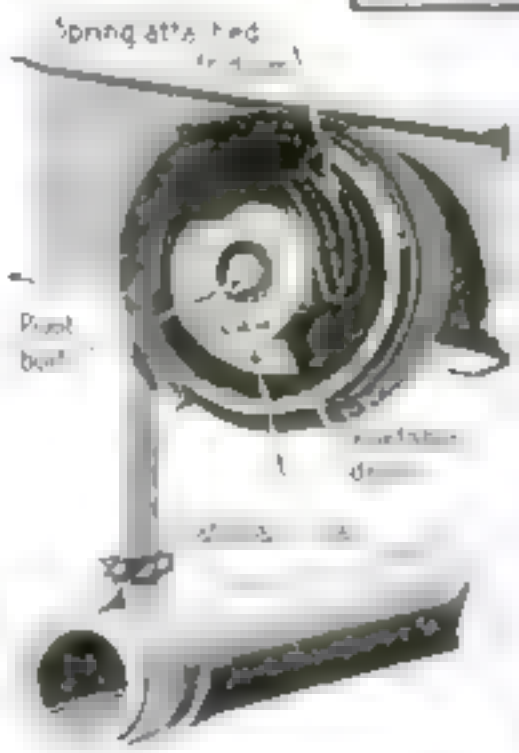
This is the footboard stove. The illustration shows the food being placed in the cooker and the valve that controls the heat

Letting Gasoline Do It

Attachments to a tractor for handling a road shovel, operated by a single person

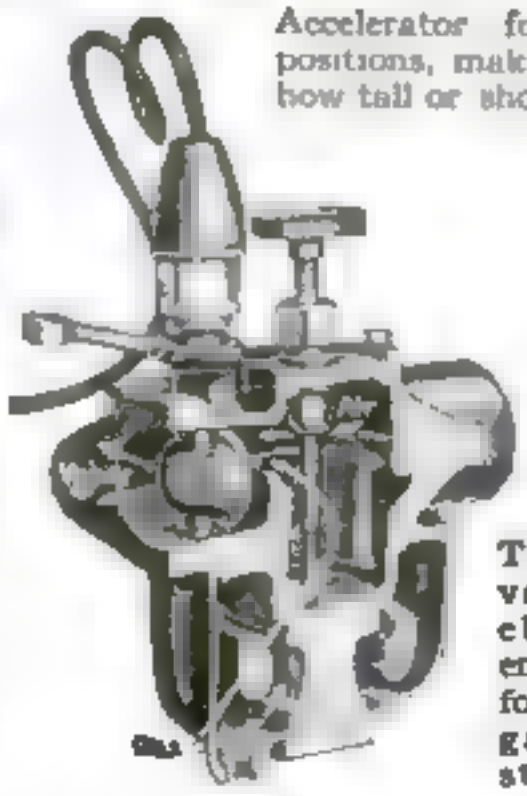
Cleaning the carbon from several material for removing the carbon is

Lattiged shoe cleaner set into the automobile running board helps to keep the interior of the car in condition



Accelerator foot-rest that positions, making it comfortable how tall or short he may be

Shock absorber within a drum, attached to the frame of a car

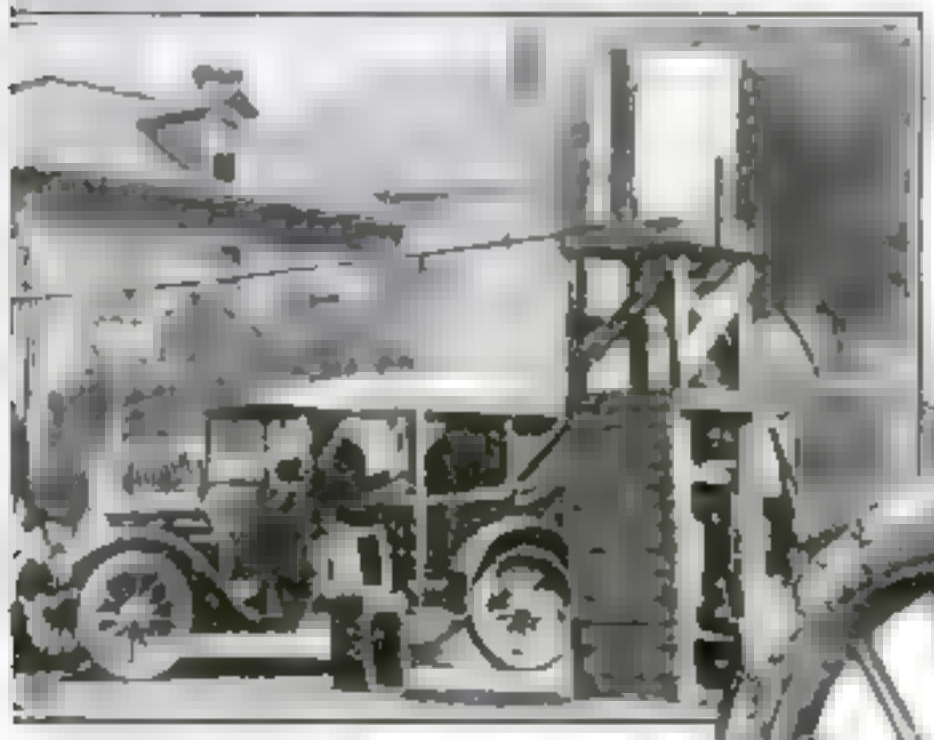


Engine piston of aluminum alloy, in skeleton form to make it light

The throttle valve has an electric coil embedded in it for heating the gas to make starting easy

Letting Gasoline Do It

A tractor need not be purchased only for summer work, it may be used in winter to harvest the ice as well

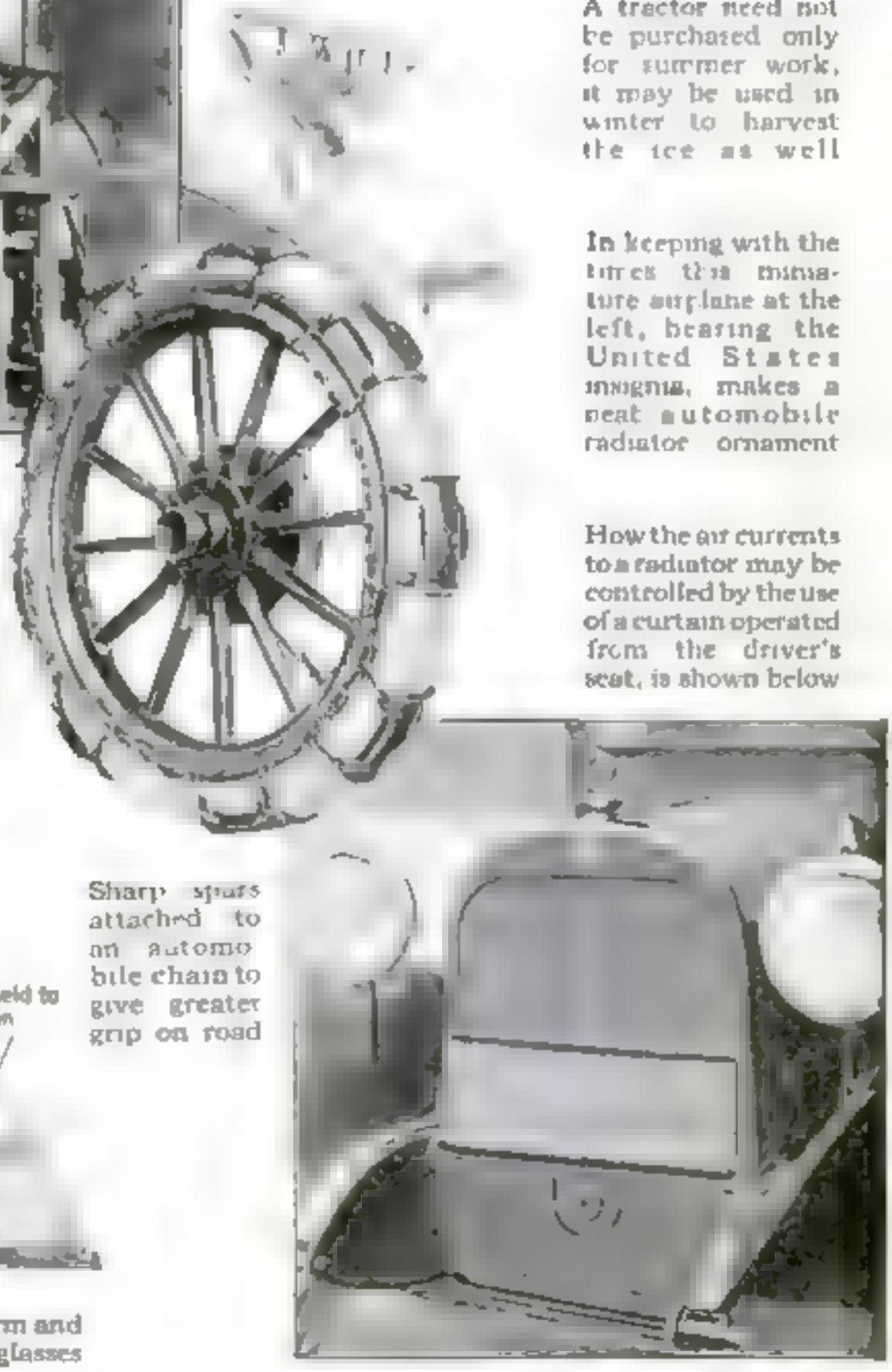


automobile engines at one time. The contained in the large tank on the right

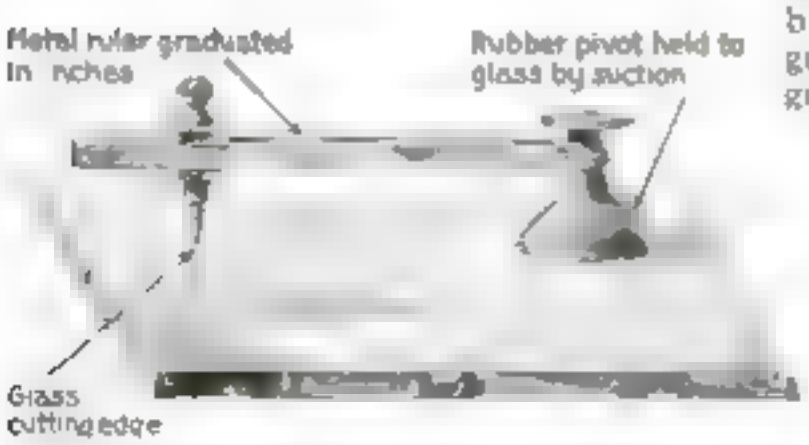
In keeping with the times this miniature airplane at the left, bearing the United States insignia, makes a neat automobile radiator ornament

has adjustments for many able for any driver no matter or how large his foot is

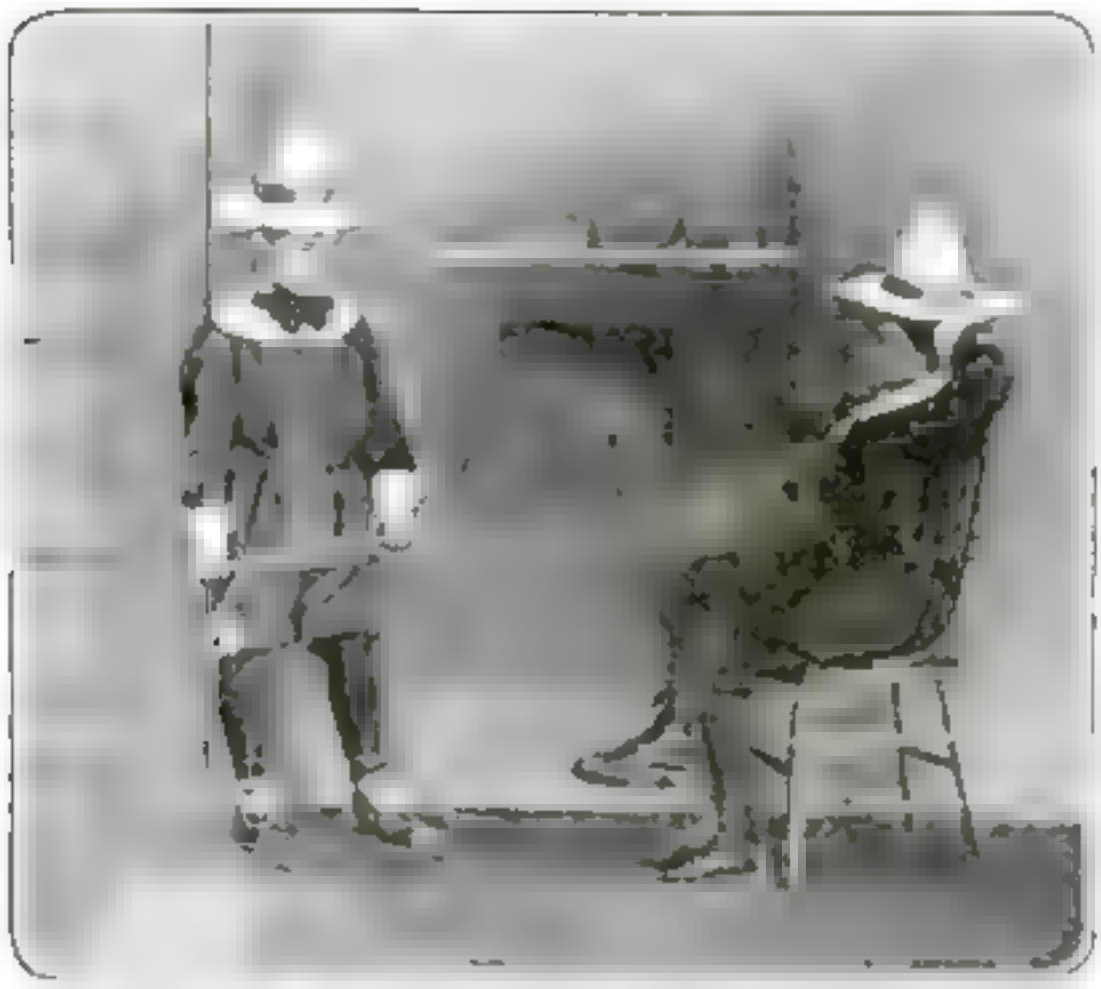
How the air currents to a radiator may be controlled by the use of a curtain operated from the driver's seat, is shown below



Sharp spurs attached to an automobile chain to give greater grip on road



Rubber base standard with revolving arm and cutter for making automobile headlight glasses



"Acting" the old Colonial days. Massachusetts school children learning history in a new and interesting way

How Many Cubic Feet in a Ton of Coal?

HERE is a little information which will help you to solve the vexing problem that is apt to be a hardy annual, i. e., how much coal to order in order to fill the bunkers, but without having to put some in an old barrel in the outhouse. A ton of egg coal contains from thirty-two to thirty-eight cubic feet, averaging about thirty-five. By measuring the cubical contents of your bin you will be able to estimate how much to order to fill them. This may be done by multiplying together the length, breadth and depth of your bin.

"Making Believe" You're Miles Standish to Learn American History

IN the State Normal School, situated in Salem, Massachusetts, a new method has been adopted to teach kindergarten children through pictures. Frederick W. Whitney, the art teacher in the school, conceived the idea of using drawings in colored chalk upon the blackboard to illustrate and make clearer the stories read to the children.

When he talked about the Colonial times Mr. Whitney greatly aided the interest and understanding of the children by improvising for them Colonial costumes made of cambric, pasteboard and paper. To illustrate the life of the Indians a forest scene was drawn upon the blackboard, while the children, dressed in Indian costume, were seated around the imaginary campfire.

In Trying On That New Hat You May Get Something Besides the Hat

THE doctor, who sees bacteria everywhere—even though they are invisible—warns you now against trying on hats in a hat-store.

Most men try on three or four hats before they get what they want, and it was discovered, by actual observation, that two per cent of them have noticeable eruptions on their faces and foreheads.

This paper skull cap may mean all the difference between sickness and health

As a measure of protection thin paper skull caps are recommended by Dr. Wallace A. Mannheimer. The caps are to be worn while trying on new hats.

Unfortunately, so far, it is only the better hatters that have introduced this protective measure, but it is to be hoped that the public will soon demand a skull cap as a matter of course, like an individual cup.

Grading Machine Does Work of 125 Men

It digs to grade and loads six hundred wagon loads in a day

This machine reduces road grading and the construction of good roads to an economical and scientific basis. It does the work of a large road gang

NOT so long ago a huge machine made its appearance on a Milwaukee street which had to be graded. The machine had creeper feet in front that reminded one of the tread of a tank on the Western Front, and in the rear a roller. There was a huge wheel on its front which tore up the dirt precisely to the depth wanted—no more and no less—with the relentlessness that never could be equalled by hand shovels.

If you want to know more about the Turbine Street and Highway Grader, look at the accompanying picture. The digging is done by a rotating cylinder on which are mounted twelve buckets. Rooters on the cutting edge of the buckets lift up the dirt and tumble it back into the buckets. As the cylinder turns, the dirt is dumped on a belt-conveyor, which extends at right angles from the side of the grader and drops the material into a waiting wagon, truck or car.

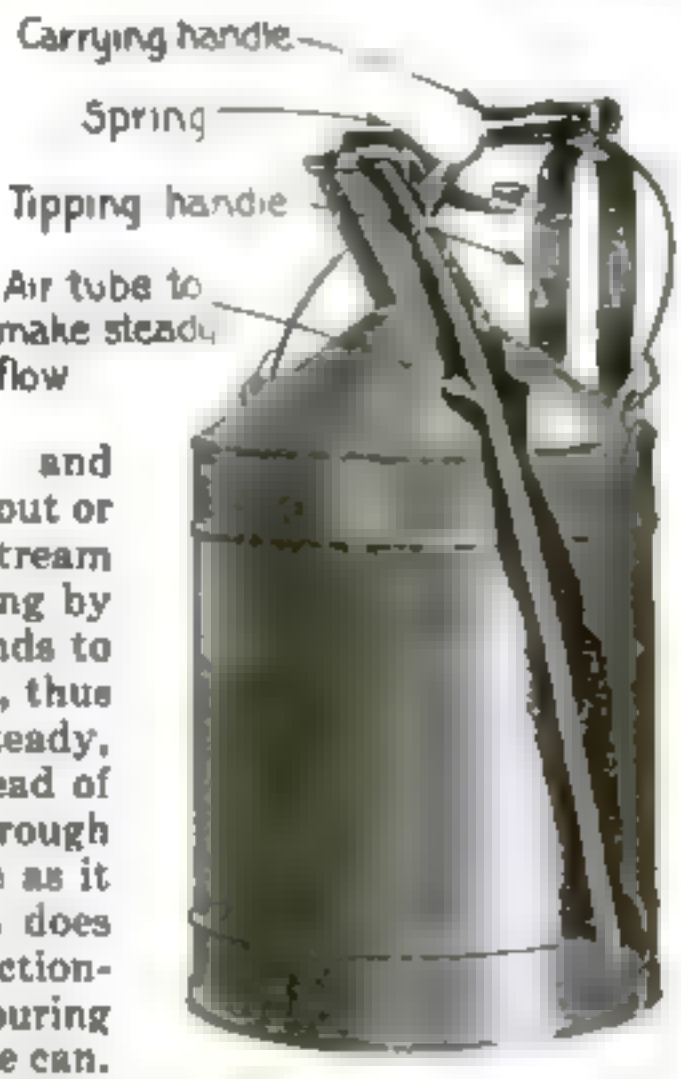
Almost everything about the machine is adjustable to suit the conditions encountered. Thus the conveyor can be adjusted to load on either side of the grader. The cutting cylinder or wheel can be adjusted vertically to make it cut from one inch to two feet deep. Cuts are five feet, seven inches wide. While the digging wheel is in action, the entire machine moves forward at any of three speeds according to depth of cut and character of material which is being excavated.

The creeper tread on which the front part of the grader is supported does away with planking and prevents settling. But if settling should occur, it is easily enough detected by sighting along the grade sticks and corrected by elevating the cutting cylinder or turbine. The two sets of creeper treads have separate controls which makes it possible to make short turns when necessary.

When it is realized that the utmost capacity of hand-shovel labor is five wagons a day and that the Turbine Grader can easily load six hundred wagons and even more a day, the possibilities of the machine become apparent. It does the work of 125 men at a great saving of cost.

A New Can for Handling Gasoline to Prevent Waste

MUCH gasoline is wasted every year by evaporation and spilling. Now a Chicago firm has introduced a new can designed to prevent this waste. It is fitted with a hinged spout cover, closed by a spring. This seals the spout the moment the pressure of the thumb on the lever is released, thus preventing evaporation and also loss by splashing out or spilling. A steady stream is assured when pouring by a long pipe that extends to the bottom of the can, thus admitting air in a steady, constant stream, instead of forcing it to bubble through the stream of gasoline as it leaves the can. This does away with all the objectionable splashing when pouring out the contents of the can.



Safety gasoline can designed to prevent waste

If all the automobile owners in the United States saved one gallon a year each they would create an additional supply of 4,500,000 gallons. This is enough to keep 1,250 airplanes in fuel for a whole year. It is the team-work that will count in this as in all else. It is the "long pull, the strong pull, and all pull together."

It Walks Through the Field, and Drags a Plow

THE tractor here shown is a small, inexpensive one that can be used very profitably on farms of less than one-hundred acres. The little mechanical worker is only four feet high and three and a half feet wide, but it will plow four acres a day with a fuel consumption of less than two gallons an acre.

The tractor is the invention of Rush Hamilton, a California orchardist, who sought in vain for a machine to do his work. It may be called a walking tractor in comparison with the creeper or round-wheel types. Note the radial tread legs on the wheels. They penetrate to the sub-soil for traction.

In plowing, one wheel of the tractor follows in the furrow, thus eliminating the side-draft on both tractor and plow or other implement. The machine is so small that it can pass under the branches of trees where even a horse could not go, much less one of the cumbersome juggernauts which most tractors resemble. It also takes up very little room to store when not in use, and is simple enough to be easily repaired by an amateur mechanic.

This little tractor is only four feet high and three and a half wide, but it will do the work of four horses. It was invented by a Californian fruit rancher for his own use

How Would You Like To Be in the Place of the Man in This Picture?

THE spiderlike silhouette near the apex of the angle formed by the falling top and the majestic trunk of the magnificent Douglas fir in the center of the picture is that of a man, the logging foreman of a lumber company on Puget Sound. These giant firs are greatly needed for the keels, frames and other parts of the big wooden ships now building for the Government and are supplied almost exclusively by the forests of Washington and Oregon states.

The big tree in the picture was one hundred and eighty feet high before its top was cut off. At the point where the cut was made the trunk had a diameter of twenty-two inches. The foreman climbed the tree with telephone-linemen's spikes and fastened himself to the trunk with a lineman's belt. It took him twenty minutes to cut the top

Cutting the top off a big fir at Puget Sound. It took twenty minutes to cut

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Here Are Some War Breads You Have Never Known

OWING to the shortage of wheat the powers that be have been experimenting to see whether satisfactory bread cannot be made from other cereals. They have come to the conclusion that they can very much so.

The chief grains which the researches have added to our food-stuffs are cottonseed meal, kafir corn, feterita, grain sorghums, and milo. So far all these have been used to feed to stock, but it is found that they can all be milled and made into bread. Not only that, but the bread is more palatable and much more nutritious than wheat bread ever thought of being. For instance, cottonseed meal contains about forty-five per cent. of proteins, whereas wheat only contains about nine per cent.

Of these new grains, Kansas, Texas, and Oklahoma can supply enough to make up this year's wheat shortage, while next year, with more planted, the supply will be abundant. Texas is capable of supplying the whole country alone if necessary, so that there is no danger of a bread shortage.

The College-Trained Elephant as a Circus Attraction

"LADIES and gentlemen," begins the official barker at a side show, "it is your privilege to see before you the only living college-trained elephant in captivity, engaged at an enormous expense by the manager of this incomparable aggregation of world-famous artists and animal shows!"

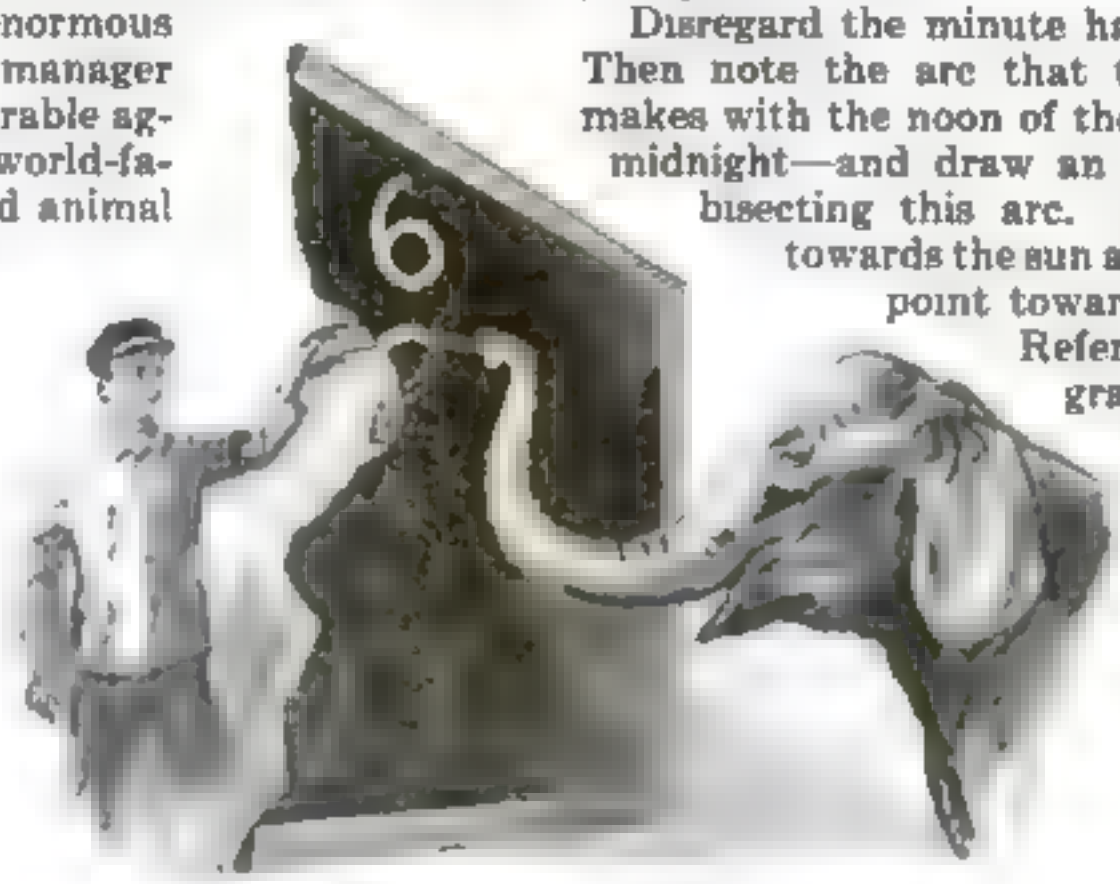
With this he presents to the elephant, who looks indescribably bored, a piece of white chalk in an iron holder.

"Will some of the ladies or gentlemen kindly name some small numbers?" suavely urges the barker and from amongst the spectators come calls of "Six—Two—Five!"

"Six—two—five," repeats the barker slowly and impressively and leads the graduate of the elephant college to the blackboard.

To the astonishment of the spectators the chalk traces a perfectly legible "6" upon the black surface. Underneath he writes a "2," underneath that a "5." Then comes the addition line and the result, 13.

An attendant on the other side of the blackboard did the trick. For his benefit the barker repeated the numbers so as to give him time to pick out the same numbers, cut out of sheet iron, and slip them into grooves provided for them. Then he grasped a powerful magnet and held it against the top of the six. To the same spot, on the other side, the barker directed the trunk of the elephant. The chalk holder being of iron, followed the magnet.



The "intelligent" elephant and the way his brain works, said brain being in the head of the attendant

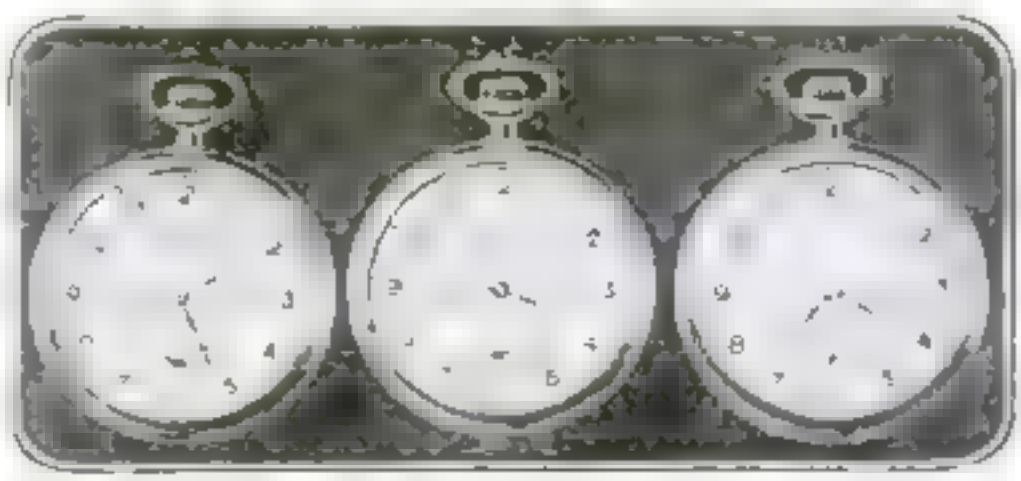
Is a Compass Necessary? Not if You Have a Watch

WERE you ever out in the "wild," carrying your map but without a compass? Your watch answers the purpose just as well.

Disregard the minute hand altogether. Then note the arc that the *hour* hand makes with the noon of the day—not the midnight—and draw an imaginary line bisecting this arc. Point this line towards the sun and the XII will point toward the *south*.

Referring to the diagrams, the first one represents 5.10 A. M. The imaginary line falls between the hour hand and the approaching noon, as shown. The second figure shows the time to be 3.45 P. M., so that the imaginary line falling between the noon and the hour hand, practically coincides with the II. In the third it is 7.20 P. M. and the bisecting line still comes between the noon and the hour hand, so that it falls between the III and the IV. The line must always *bisect* the arc, whether it is more or less than a semicircle.

One's watch makes *two* circuits while the sun makes *one*. Therefore *half* the arc between the hour hand and the nearest noon, pointed toward the sun, causes the noon—the XII—to point due south.



Dotted line in each case represents imaginary line bisecting arc between the hour hand and the noon

Here, Now, Is the "Tappoon"—a Portable Flood-Gate

UNTIL very recently it has been the practice among ranchmen when irrigating a field to dam up the ditch with mud in order to make the water flow into the lateral ditches. Howard R. Wallace, a ranchman who lives near Long Beach, California, changed all this by devising a portable irrigation flood-gate.

This is the tappoon. It is the invention of a Californian rancher and is designed to simplify irrigation

The gate is simply a sheet of heavy-gage wrought-iron—the lower corners are rounded off and a handle is bolted to its upper edge. When the gate is pressed down into the mud of a main ditch it holds the water back and diverts it into the lateral ditch immediately behind the dam. When that ditch has sufficient water the gate is pulled up and moved to the next lateral. All the work of making scores of small dams with mud is avoided.

The tappoon, as Mr. Wallace terms his device, is an inexpensive thing to make, and in the course of a California summer it saves many hours of hard labor. It is very light and can be easily carried about, and obviously has nothing to get out of order. To shift it one merely lays hold of the handles on each end and pulls it up, carrying it to the next location and pressing it in with the foot. This is one of the little things that count. It saves both time and trouble, and lightens the tedium of a thankless job.

Fish at Night with an Electric Light on Your Line

WHEN the fishing fever has fastened upon him and is at its height, the enthusiastic angler would lengthen his day, if he could, to fully forty-eight hours. One ingenious American, probably spending an all-too-short vacation in the woods, devised a plan for illuminating the end of his line and thus tempting the fish to rise even on the darkest night. In the hollow interior of his bamboo rod he placed a small electric battery of sufficient power to operate two small lamps, one attached to the rod and one to a buoy just above the baited hook. The purpose of the buoy is to prevent the lamp from being submerged. The electric wires between the end of the rod and the buoy take the place of the fishing line. The light on the buoy not only serves to attract the fish but also by its bobbing informs the angler when a fish takes the hook and is due to be hauled in.

This is an application of the old method of fishing at night with a light. The usual method, of course, is to go out on the lake in a boat, carrying with you one or two hurricane lamps. One of these you keep in the boat to see by, and the other you fasten to the gunwale so that the light will attract the fish. In this case one uses an ordinary line, of course, and trusts to pure blind luck for results.

The illuminated fishing line by means of which one can catch fish at night

Put the Tree in the Barn, Put the Cat Out, and Go to Bed

THERE'S no accounting for taste. Here is an instance where sooner than cut down a fine old tree a new barn was built around it, the trunk passing through the roof. Whether this is due to conservation or to sentiment we are not aware. It undoubtedly is a pity to cut down beautiful old trees, but just the same one would imagine that a tree in the barn would be, to say the least of it, inconvenient. Whether it is profaned inside the barn with nails and hooks and harness, who shall say? Whatever the reason, there it is, and it at least has the merit of being exceedingly picturesque in appearance and probably is unique.

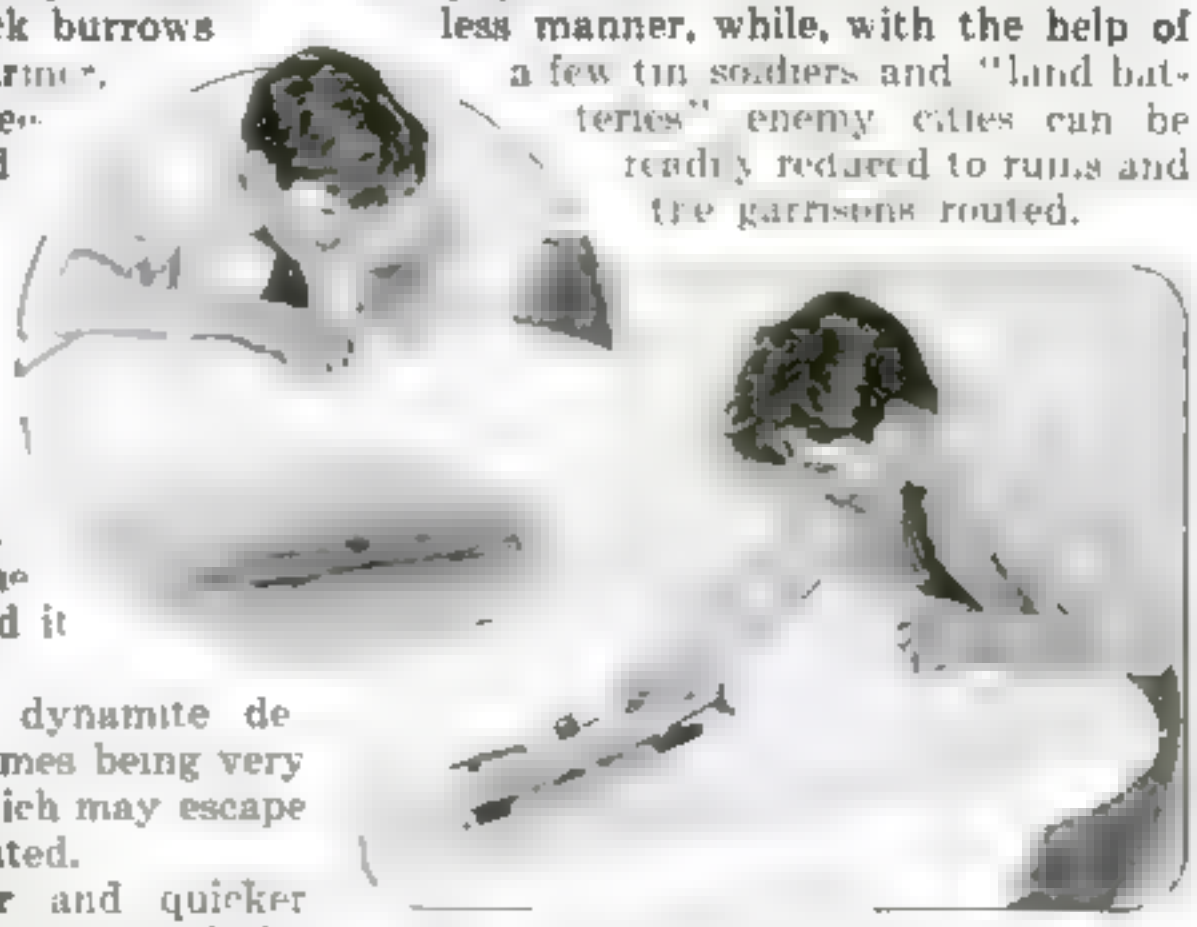
They built the barn around this tree to avoid cutting it down

The Battle of the Bath-Tub Fought with Toy Submarines

A TOY submarine that really runs under water has been recently put on the market. It is fifteen inches long and is constructed of wood and metal. As equipment it carries steering and diving planes, a deck gun, and a torpedo. The motive power is derived from elastic bands, and the boat will travel from twenty to forty feet under water, at any desired depth, either straight ahead or in a circle.

The torpedo is fired from the deck gun, and is controlled automatically so that it is discharged to a distance of four or five feet as the boat rises to the surface.

Two boys, with two or three of these realistic toys and the necessary facilities for sailing them, can stage all kinds of sham battles and naval maneuvers. Blockades can be carried out and paper boats sunk in the most relentless manner, while, with the help of a few tin soldiers and "land batteries" enemy cities can be readily reduced to ruins and the garrisons routed.



The toy submarine which dives and circles. Note the heavy artillery it carries

Ef Ye Cain't Shoot the Critters, Dynamite 'Em

A VERY simple and cheap method of destroying wood-chuck burrows has been discovered by a farmer. He takes a stick about three-quarters of an inch thick and about ten feet long, and ties a stick of dynamite to the end, ready capped and with two feet of fuse. He lights the fuse and pushes the charge into the hole. As the fuse takes about a minute to burn down, he has plenty of time to tamp the earth around it and get out of the way.

The explosion of the dynamite destroys the den and, the fumes being very poisonous, any animals which may escape the explosion are asphyxiated.

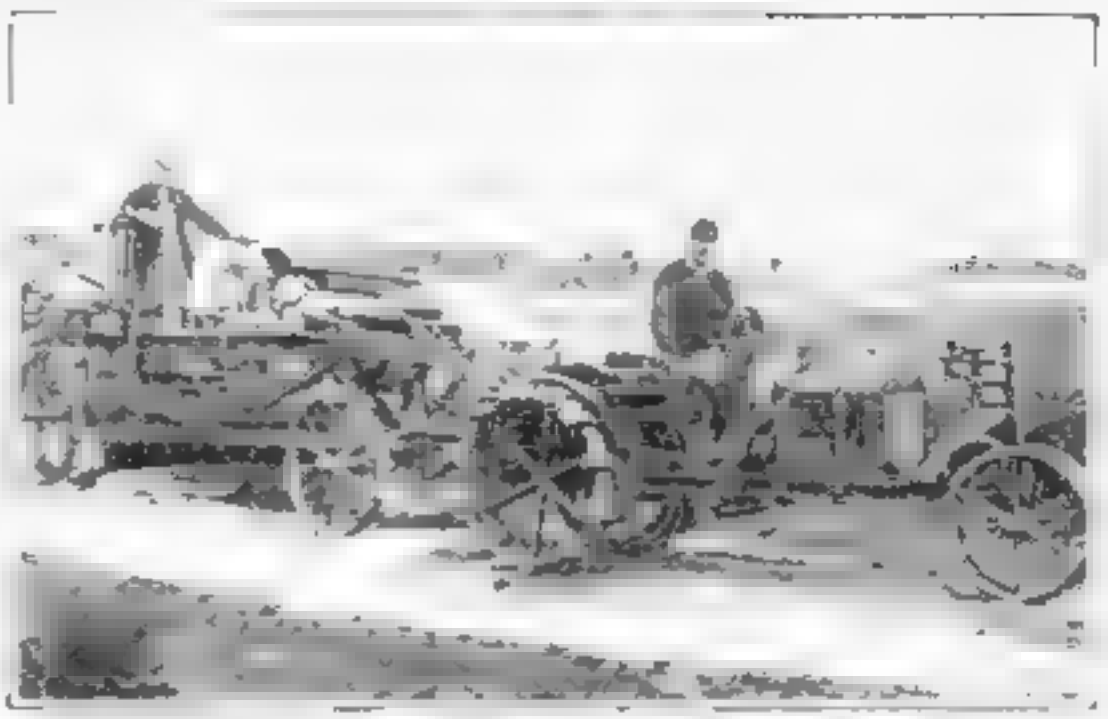
This is a far simpler and quicker method than digging them out, and the explosion fills up the burrow too.

The Farm Tractor As an Aid in Road Building

IN Atkinson, New Hampshire, the farm tractor has been successfully used in making and repairing roads, doing away with horses.

A twenty-horsepower tractor, as shown in the picture, was used in conjunction with the regulation road-machine for rounding off the surface of the road and cleaning out gutters. It was found that the tractor not only easily does the work of six or eight horses, but better and in less time. Two men only are required as compared with the four required with the former system. Besides, double the ground is covered.

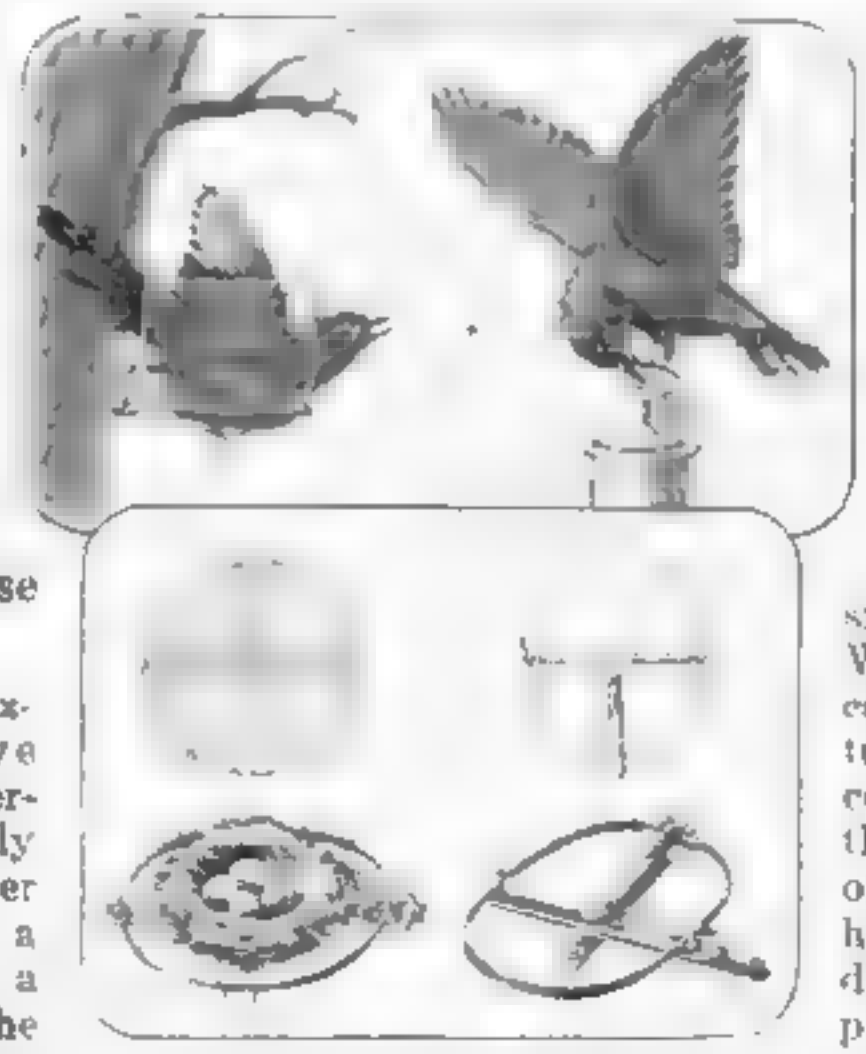
When the tractor is used with the road-drag, one man, driving the tractor, can round up and smooth as much State road in half a day as one man with a pair of horses in one day and a half. The tractor hauls four to six cartloads of gravel in the same time that a two-horse team requires for one load. Figured in dollars and cents, the tractor could easily do $24 worth of work at a cost of only $8, with an additional saving of from twenty-five to fifty per cent in time.



This twenty-horsepower farm tractor proved itself a valuable and efficient aid in road repairing in Atkinson, N. H.

Trapping the Wise Old Crow

SINCE time and experiment have proved that the average crow is perfectly able to decide whether or not an object in a field can handle a gun, traps to lure the bird are now being tried out. One of the most successful of these traps assumes the form of a nest fastened securely to the branches of trees, or to any convenient support in the locality to be protected. The nest is made of strong wire mesh, padded in much the same way and with about the same materials as if made by a mother-bird. But the nest rests on a delicately balanced spring which is operated by a lever just under the eggs. When the crow gives his first investigating peck, the two sides of the supporting framework of the trap-nest come together like the leaves of a book, with bonecrushing force.



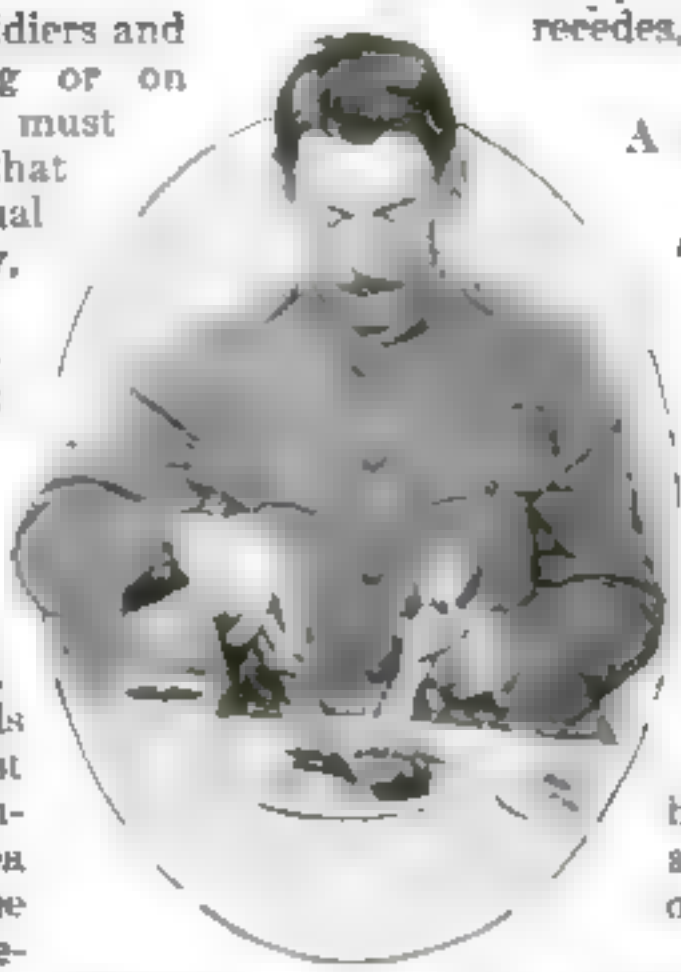
Above are shown various kinds of traps for catching the wily crow. The effectiveness of some depends on his appetite, others on his curiosity. Scarecrows are ineffective—he knows too much

Another trap which has proved successful looks like a workman's dinner pail. The cover is turned down, with just enough of an opening left to emit the tantalizing smell of cooked food. With hungry lack of caution, the crow attempts to sweep the cover off with his foot, the two steel sides of the trap, which he had mistaken for handles at the side of the pail, come together and grab him by the leg, holding him with painful effectiveness to await the further vengeance of the farmer.

A Fork and Spoon in One—Part of the Soldier's Kit

LIKE other mortals, soldiers and sailors, in training or on active duty at the front, must eat. It is not often that they object to the punctual fulfillment of this duty, provided the "grub" is fit. Uncle Sam sees to it that it is "fit" and that there is plenty of it. Every soldier and every sailor is required to carry his own kit, comprising knife, fork and spoon, and to keep it clean.

There are many kinds of these kits in use, most of them combination utensils, planned with the idea of preventing the three parts of the kit from becoming separated. One of these kits has the advantage of being light, compact and simple. It consists of two parts only, each stamped out of a single piece of steel. The knife forms one of the parts while the other part has a spoon at one end, a fork at the other. The two parts, which are heavily nickeled, are so arranged that each fits into a groove in the other part, so that the sharp edge of the knife and the tines of the fork are protected.



Knife and fork kit in detail and in use. It is very compact

Catching Fish Without the Use of Hook or Net

THE scarcity of meat and the consequently increased demand for sea food has made the whiting, which is also known in different parts of the Atlantic coast as "frost fish" and "silver hake," extremely popular. This fish usually begins running along the New Jersey coast in November and remains until the following May. On cold, frosty nights the fish leave their comparatively warm haunts in deep water and seek the shallow waters in search of food. Thousands become benumbed by the cold and remain stranded upon the shore when the tide recedes, an easy prey for the fisher.

A Baby-in-the-Tree-Top Hammock

THE jingle about the baby in the tree top, which represents the height of juvenile comfort, might serve very well as an advertisement for the hammock illustrated. Made of open mesh which enables the air to circulate about the body, and equipped with a mosquito net and sun blind, it will accommodate a child up to four years of age.

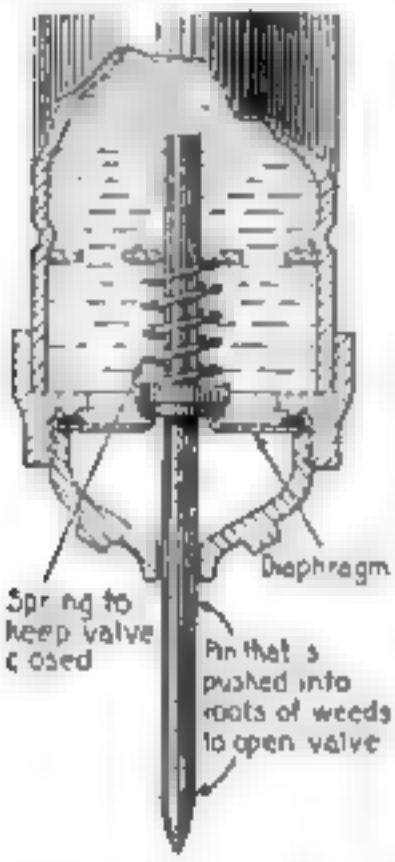
The baby in the hammock is safe, for a lace which can be tightly drawn holds the body, even though the hammock should be tipped upside down. The device is made in different sizes to accommodate grown-ups as well as children, but the manufacturers claim that the child's size hammock illustrated is strong enough to hold a man, so that ample latitude is allowed to guard against all possible mishaps. This makes it eminently suitable for general use in the garden.

An open-mesh hammock with laces to draw it together and a sun blind to protect the eyes

Have You Weeds on Your Lawn? Kill Them With Gasoline

THE complete elimination of dandelions, ragweed, quack grass, and troublesome weeds that grow on the lawn is made easy by a device that eliminates all back-breaking stooping. The instrument consists of a slender tube filled with a liquid and provided with a sharp point that is pushed into the heart of the weed; the liquid then automatically runs out, and the weed is killed beyond the power to grow again.

At side detailed drawing of weed killer. Above, the same in use on a lawn



For killing dandelions and most ordinary weeds a gasoline solution is most effective, while a solution of iron sulphite is used for pig weed, rag weed, and quack grass. The device is all metal, and very simple in construction; none of the metal parts is affected by the liquids. Pressing the tool into the ground raises the valves and releases a little of the liquid. The tube may be filled by twisting the handle and removing the top.

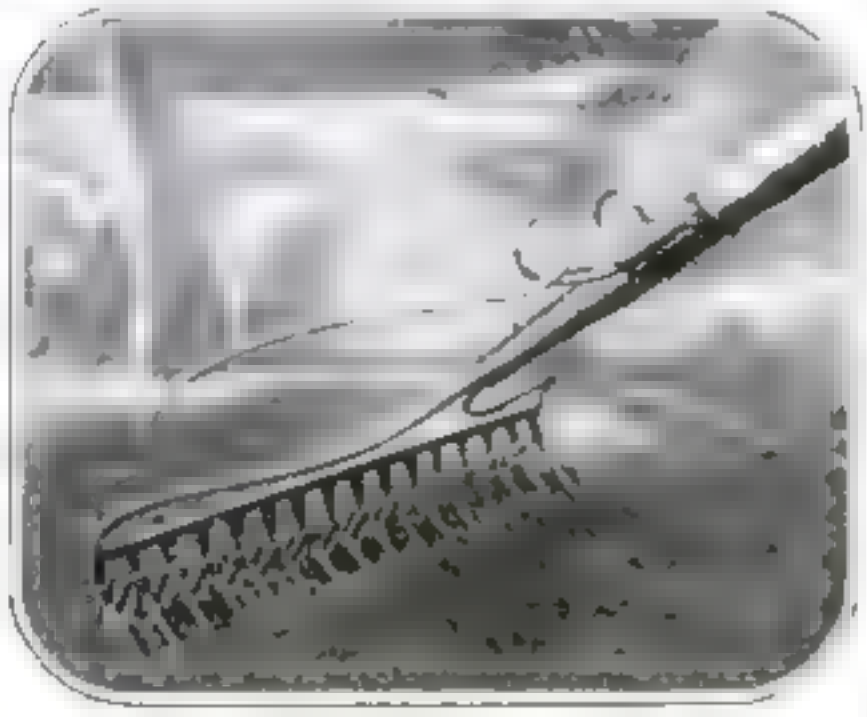
Efficiency Has Come to the Garden Rake

ONE day, Charles F. Reiter of Minneapolis, Minn., lost his patience when raking his lawn—and who wouldn't, when the leaves seemed to take extraordinary pleasure in sticking between the teeth of the rake. After Mr. Reiter had bent down and pulled the leaves out so many times that his back ached, he threw down the rake, went into his house and invented a temper-saving, back-resting device which cleans the rake automatically.

The automatic self-cleaning attachment is simply a curved piece of wire which, manufactured in any desired length to fit any rake, sets between the teeth of the rake. Wire arms, operated by springs are attached to the handle and to the curved cleaning wire.

When the rake touches the ground, the cleaning attachment is pushed up out of the way. The leaves or scraps are raked in the usual manner. But when the rake is lifted for the back stroke, the wire arms are pressed down by two single coil springs, and the curved wire instantly pushes out the leaves accumulated on the prongs.

It will be seen that in addition to saving the trouble of cleaning the rake, all the leaves, etc., that are collected would be worked into the soil, thus helping to make the "leaf-mold" that is so highly valued by horticulturists.

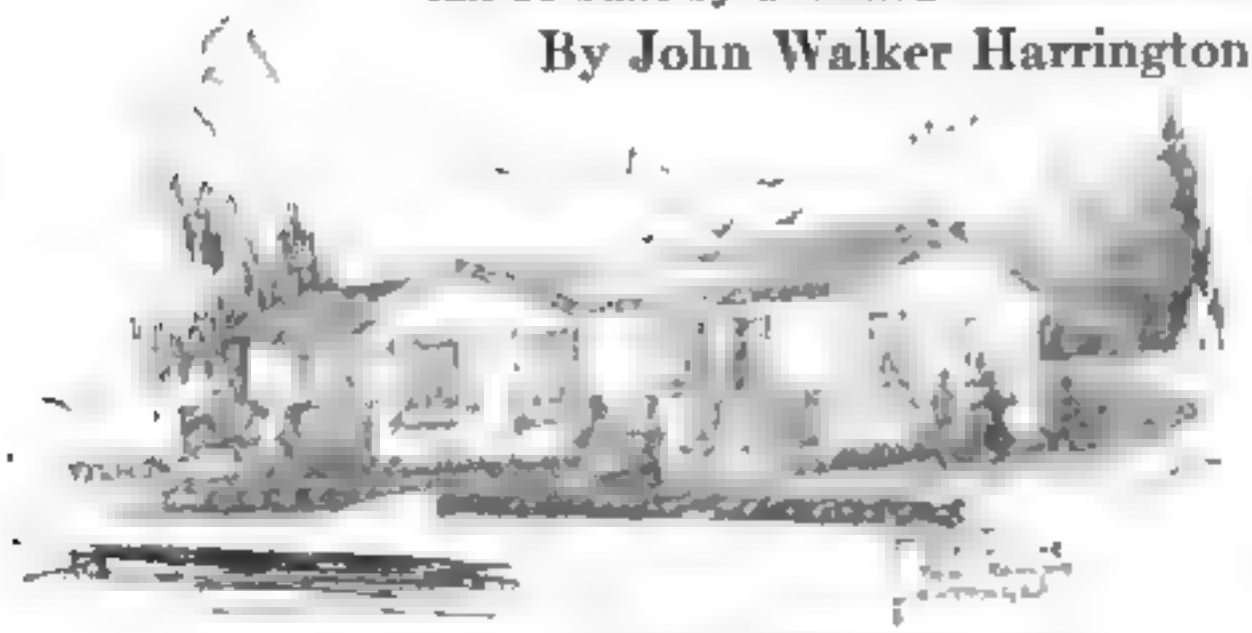


This simple, self-cleaning rake is the outcome of a Minneapolis man's impatience

Homes for War Workers

A new type of standardized dwelling which can be built by unskilled labor in two weeks

By John Walker Harrington



Workmen's houses of concrete, all different from each other, can be built exceedingly rapidly and cheaply

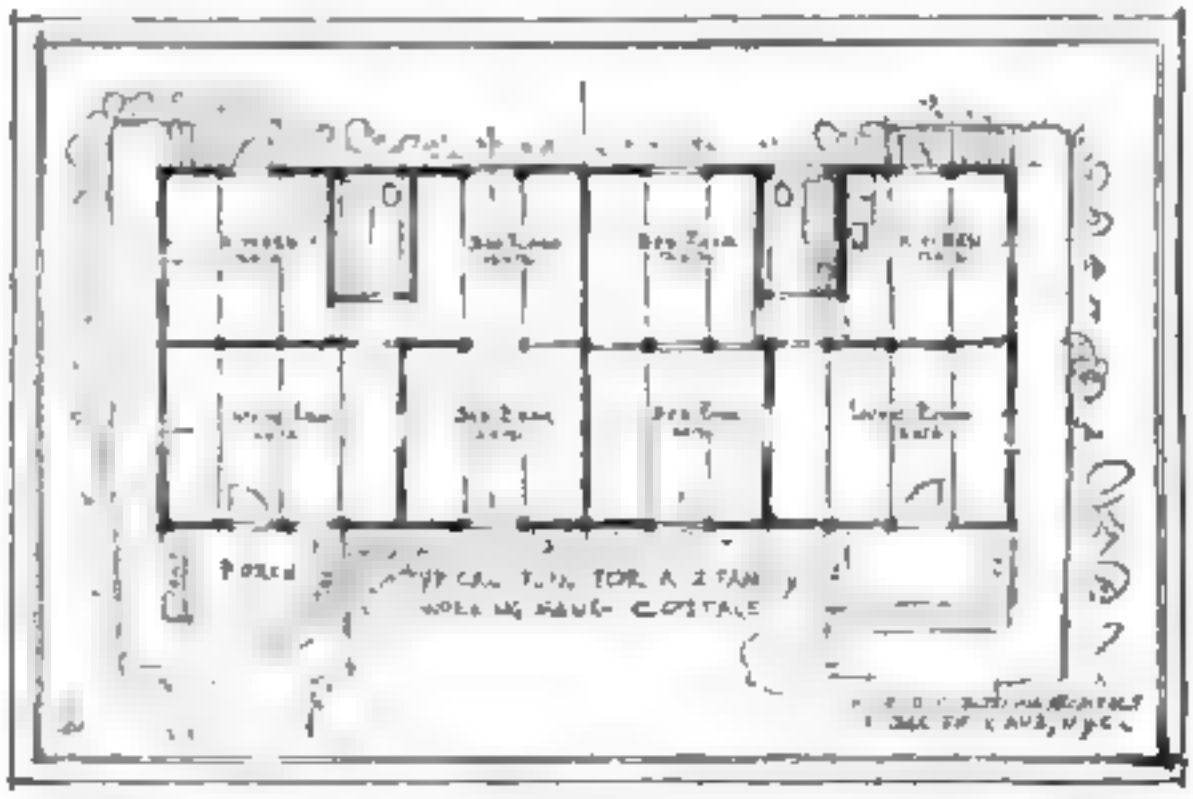
WAR workers' dwellings may be built at about half the usual cost and in half the customary time by a novel method originated by Mr. Alfred C. Bossom, a New York architect, according to estimates submitted by him to the Council of National Defence.

His scheme is the result of personal studies of actual conditions at leading American shipyards and munitions plants. It also embodies his experience as an expert retained by large industrial corporations in this country as well as by the housing committee of the London Common Council.

The construction is best adapted for fireproof materials. Wood may also be employed.

Under the Bossom plan, large sums may be saved in preparing the sites proposed. The ground for a hundred or so of workmen's cottages is leveled off at once. Then a military trench digger is run along the lines for the foundations. The resulting ditches are sheathed inside with boarding which projects a few inches above the earth. As there are to be no cellars, the work of excavation is soon completed.

There next appear strange devices resembling the cradles on which ships are sometimes carried overland and from which they are again launched into the water. These house cradles are huge frameworks of heavy timber which are readily moved on rollers. Suspended from them at regular intervals are three uprights of reinforced concrete or steel, or even wood, which are to be part of the skeleton of the one-story dwellings. The cradles are steadied against the pull of these verticals by counterweights piled on low platforms on their opposite sides and are adjusted by wedges, until everything is made plumb. The pillars are then lowered into the trough, and their feet are soon embedded in concrete dumped into the foundation form from wheelbarrows. As soon as the cement hardens, the cradle is withdrawn and the next three posts are launched. As several cradles may be used at once in building a house, both the outer wall uprights and

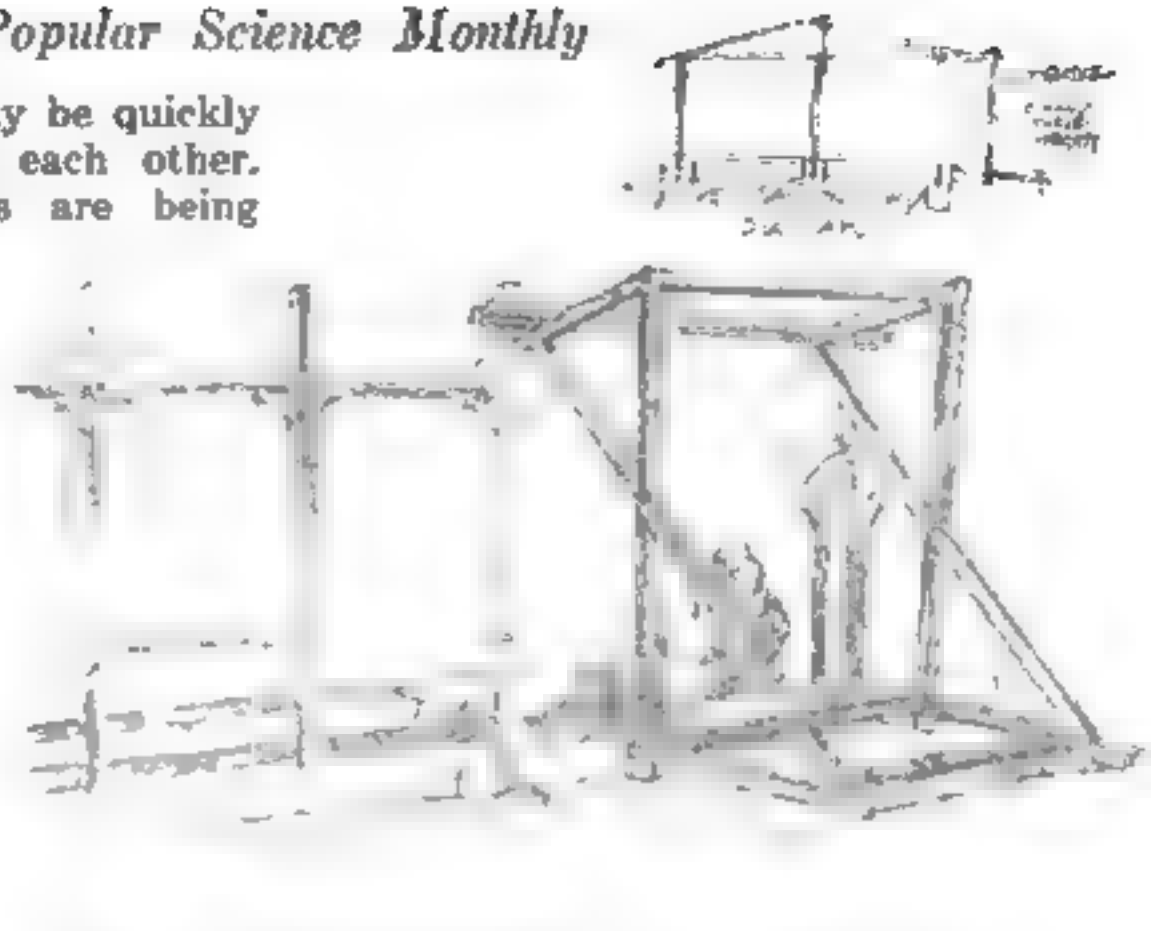


Here is a typical plan for one of the proposed cottages. This particular one would be a two-family house, semi-detached

those for the partitions may be quickly trued up and alined with each other.

Meanwhile, the supports are being braced together by cross-pieces, as holes have been left in them all, where the horizontal beams may be secured. Short members are placed between the uprights so as to permit the introduction of doors and windows, the frames of which can be wired in place.

At the same time workmen standing on stepladders put the rafters in position, making them fast with pegs and wire, just as the other beams have been fastened. No scaffolds are required.



Trenches are dug by machine, and then the main supporting pillars are all dropped in together with a cradle

High rib lath is then attached to the sides and spread on the roof and firmly bound down. For the walls two areas of wire web or lath may be used, so as to give further stability. The metal meshes are then plastered from within and as soon as the plaster has set sufficiently, stucco is applied to the outside wall with a cement gun. Because of the air spaces, walls of this character have a considerable advantage over those of the poured concrete variety which often sweat and give the tenants of the house a sense of chill. The roof is also of stucco, handled in the same manner as that composing the walls. The portion of the concrete foundations rising above the earth serves as a base for floor joists and also incloses an air-chamber underfoot. Here then we have a fireproof, vermin-proof, rodent-proof and damp-proof structure.

Although these new models may be built from standardized parts, pleasing and attractive variations may be made by adding a gable here and there or altering the pitch of a roof. These one-story cottages can be erected for one family, for two or for three families, so that a village of them would not be cursed by sameness. The architect has had forty variations of the idea worked out in his drafting room. Further antidotes to monotony may be provided by painting the exterior stucco walls in different tints, and also by devising striking color schemes for the shutters, the doors and the roofs, so that there may be no two houses together which appear to be exactly alike. Here the paint gun serves both beauty and economy.

The cost of these dwellings can be kept very low, in the opinion of the inventor, because they can be built by unskilled labor under the direction of skilled foremen. Laborers whose wages would be only $2.25 to $2.50 a day could do work for which in ordinary construction the services of carpenters and masons at from $5 to $7 a day would be required.

Houses of this type, exclusive of equipment, could be erected, according to this plan, within two weeks of the time the trench digging machine went into action and under favorable conditions only one week would be required.

The installation of a general steam or electrical heating system would be provided for long in advance, or if stoves are used, the needed warmth would be readily obtained. Lighting and plumbing, although requiring the services of skilled men, could be reduced to the simplest terms.

One-family houses built under these specifications can be erected at from $700 to $1,000 each, including the cost of land in the average new industrial community. These standardized dwellings, the unit of construction, consist of a living room, a kitchen, dining-room, two bedrooms and

But the most admirable feature of the plan is this: the houses need not be all alike

a bathroom. The two and three family houses would cost proportionately less. It is estimated that a four-room and bath cottage built under the new method, could hardly be duplicated for less than $1,800 under conventional schemes of construction, using the same materials. The two family dwelling costing less than $1,200, with four rooms and bath and a porch for each user, is especially desirable.

The price of lumber is now so high that the erection of wooden houses similar in design to those here described would cost from seventy-five to eighty-five per cent of the sum expended for houses of brick or reinforced concrete. Such costs, however, vary greatly according to localities and the accessibility of supplies. Leading architects agree that after-the-war developments will justify the expense.

Real Lights for the Automobiles in Motion Pictures

MR. LANGDON McCORMICK of New York thinks that the present motion picture representations of night scenes are not sufficiently realistic, especially in their lighting effects.

It is his belief that representations of light on the screen, such as lamppost, automobile, and locomotive lamps, should be lights in reality, instead of pictorial representations.

As most night scenes projected on the screen are photographed in daylight and tinted blue to give the night effect, it is true that there is an absence of glow. But from our knowledge of motion picture projection we fail to see a practical need in Mr. McCormick's invention.

He proposes to arrange a number of tracks behind a translucent screen, upon which actual electric bulbs are to be dragged along by motors. These lights will be caused to move about on the screen to correspond with the ever changing positions of the lights in the picture.

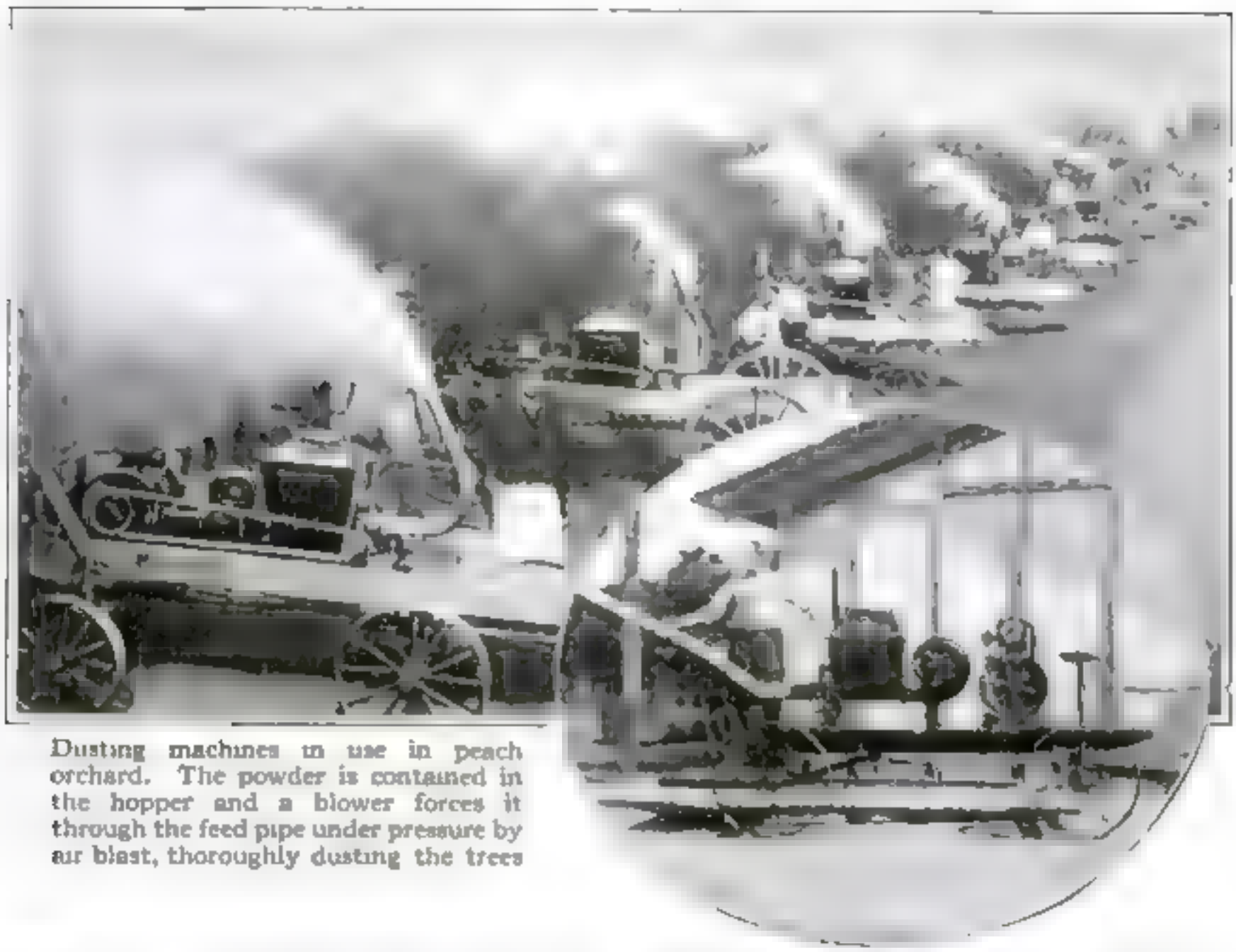
How this corresponding movement will be accomplished we do not know, but we are certain that if it is at all possible it can be accomplished only more or less successfully in a direct side to side or up and down movement which involves no perspective changes.

As regards objects which come forward or recede in the perspective of the picture it is well understood that they change their size during their movement.

No provision is made for this change in size of the traveling lights and if this method were actually applied to a picture of an automobile going away from us into the distance the car would be seen to diminish in size while the tail-light would remain unchanged, and this effect would continue until the machine became much smaller than its tail-light. Literally speaking the automobile would disappear in a blaze of tail-light glory.

Killing Bugs with Dust

This new way of exterminating insects in orchards is fast superseding the old spraying method



Dusting machines in use in peach orchard. The powder is contained in the hopper and a blower forces it through the feed pipe under pressure by air blast, thoroughly dusting the trees

IT was formerly the custom to mix the poisons intended to kill orchard insects with water. A new method is now employed. The trees are dusted with the powdered mixture.

The tremendous advantages of the dusting method, and its success in controlling the insect pests and diseases have led to its adoption by many growers of fruits, especially in New York. A man living at Middleport, New York, has recently perfected a high-power machine which pumps the dust on the trees.

Dusting is twenty-five per cent cheaper than spraying. Orchards which it formerly took three men and a team two days to spray may be given the same protection against most insects and diseases with two men and a team in three hours time. The total weight of the dusting machine complete with gasoline is less than one thousand pounds. Wet seasons, soggy or rough land in no way interfere with dusting.

The dusting mixture is placed in a hopper. A blower, which rotates at approximately 2,500 revolutions per minute, forces a current of air through the air chamber at the bottom of the hopper. The dust is sifted through a slide feed and carried with great velocity through the outlet pipe. At the mouth of the pipe the flow is broken and the dust particles burst into a dense smokelike cloud, which will cover thoroughly a large apple tree almost instantly.

Beneath the plate at the bottom of the hopper is a slide feed regulator consisting of two diagonally slotted slides which work over each other. The position of the slides is controlled by a small hand lever conveniently located at the end of the hopper near the discharge pipe. The operator is thus permitted to regulate the amount of material to be discharged, which may be of one amount for apple trees, another for cherry, and so on.

This ladder will not slip, buckle or collapse

A Safe Ladder Appears. You Can't Break Its Rungs

CHARLES J. BROWN, of River Falls, Wis., is the inventor of a new ladder which combines many advantages and novel features. His ladder is light yet strong, and its rungs, which are of metal, are so fastened to the wooden rails of the ladder, that the structure becomes perfectly rigid.

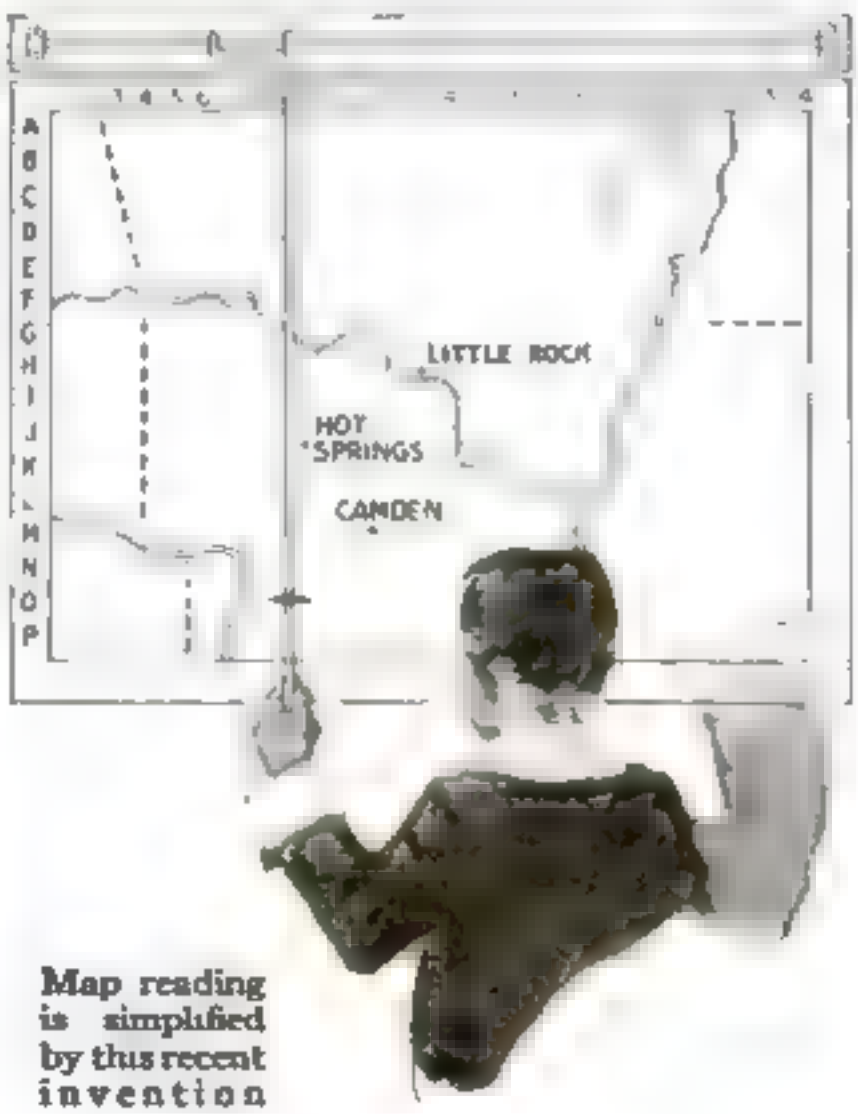
The rungs have a flat tread which prevents the foot from slipping. Safety devices are provided, which prevent the slipping of the lower end of the ladder on smooth or uneven ground, and the slipping sideways of the upper end. There is also a locking device, which makes it possible to use the invention as a roof-ladder, or in place of a trestle without extra braces to prevent the spreading of the ladder at the bottom. The ladder may be used either as an ordinary extension ladder or as a step-ladder and its rigidity enables it to stand the most severe tests.

Chemicals and Machines Supplant Men In This War

THIS is the most scientific war ever fought. There is less dependence on man-power and more on machinery than at any time in the history of the world. We pin our faith to high explosives, poison gases, tear shells, gas masks, liquid fire, etc., all of which are applied chemistry, and to machine guns, heavy artillery, automobiles, submarines, airplanes, and so forth, which are very much refined mechanics. The greatest minds in the scientific and mechanical world have pooled their brains and obtained wonderful results.

Place-Finding on Maps Is Made Easy by New Device

THE system of using index letters and numbers to enable one to find any spot on a map by referring to an index has been amplified by a device primarily designed for wall-maps, but could doubtless be adapted to smaller ones too. A rod slides along the top edge of the map and carries a movable indicator. The indicator is first adjusted to the proper place on the side index, and then the rod is moved along until it coincides with the correct letter or figure on the top index. The indicator then automatically points to the desired place.



Map reading is simplified by this recent invention

Warming Both Engine and Car Body

An apparatus that will keep you warm and avoid cracked cylinders too

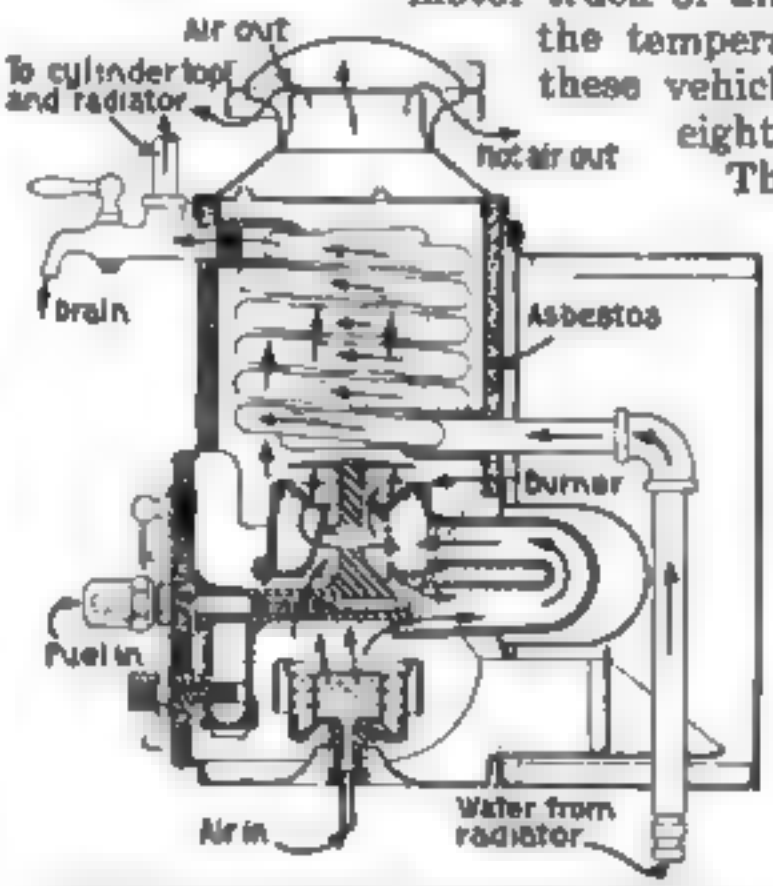
THE problems of keeping the engine of an automobile warm during freezing weather so as to prevent cylinders from cracking, to make starting easy and to heat the body interior for comfort are solved by the combination engine and body heater shown in the accompanying illustrations.

The apparatus works on an entirely new principle and consists of a coil-heater fired by a gasoline-burner. The coldest water is taken from the bottom of the radiator, heated, and injected into the top of the cylinder water-jacket or circulated through a small radiator in the car body. The hot water can be used for both purposes at the same time if desired by manipulating a small by-pass valve. In any event, the water finds its way back to the bottom of the radiator, thus completing the cycle of operation.

The complete heater, weighing but ten pounds, is bracketed to one side of the engine. It consists of a lagged cylindrical barrel containing two coils of copper pipe and a gasoline-burner at the bottom. The fuel is carried in a tank on the running-board and is fed under pressure through a special reducing-valve to the burner so that the heater may be in operation during a short wait at the curb in the day or at night when the car is garaged.

It is claimed that the amount of fuel required to run the heater is negligible and that its use in reality saves considerable fuel because it is unnecessary to flood the carburetor when starting the engine. By keeping the engine warm, the fuel vaporizes more completely so that its full power is immediately utilized and not wasted in passing out through the muffler. The heater can be applied to any make of automobile, motor truck or ambulance. It can keep the temperature inside of any of these vehicles at from seventy to eighty degrees Fahrenheit.

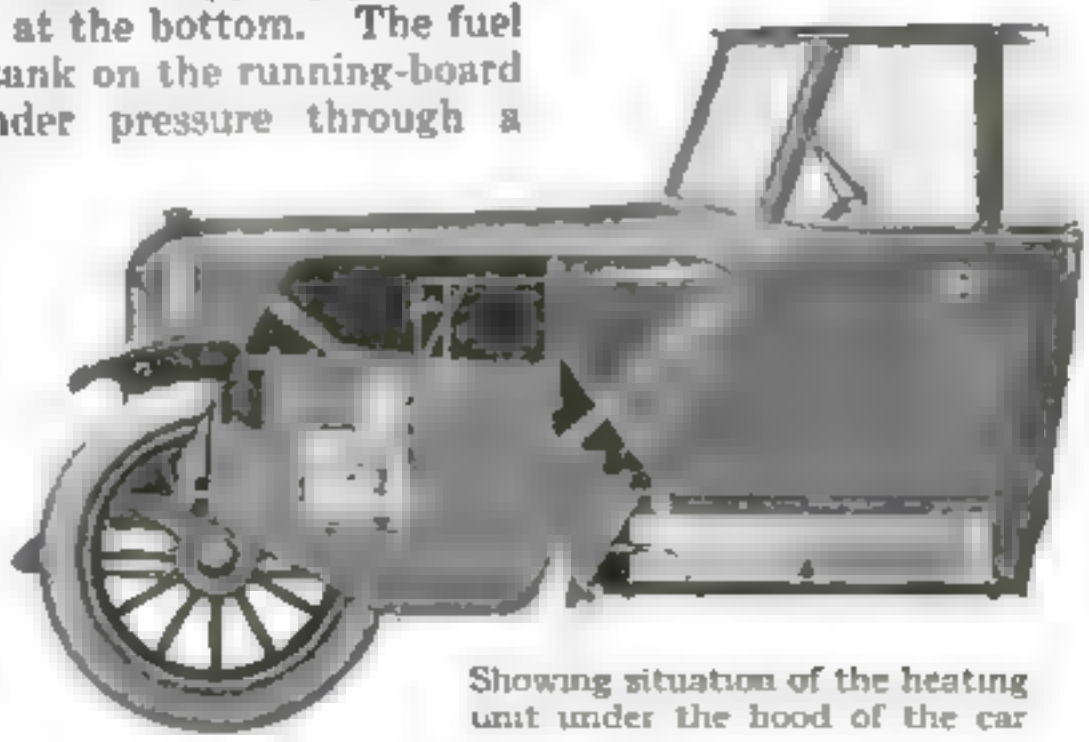
The apparatus is not very difficult to install, for it is compact and self-contained. When a suitable location under the hood has been found for the bracket it is bolted on *en masse* and the proper connections run to the various necessary points. It has the great advantage of being independent of the engine.



Details of a gasoline fired water heater for warming up the car and engine

German Tires are Filled with Rags

RUBBER tires for automobiles are reported to be practically unobtainable in Germany and Austria and to give to the wheels some kind of protective elastic cushion, tire casings are stuffed with any material that affords some degree of resiliency, like cork, paper, rags, etc. In some cases the rims are without tires at all.

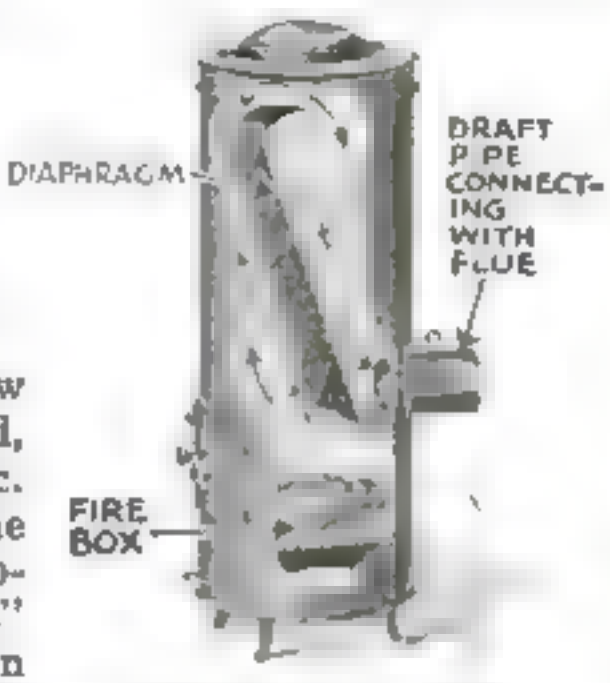


Showing situation of the heating unit under the hood of the car

A Simple and Effective Heat-Economizing Stove

AT a recent exhibition of heating appliances in Paris, a simple heating stove of sheet iron was shown, which, it is claimed, greatly economizes heat and fuel. The stove is intended for burning vegetables, fuels of low heat value, such as wood, peat, sawdust, bark, etc. In outward appearance the stove resembles the so-called "cannon stoves" which were so popular in this country about thirty years ago.

The characteristic feature of the stove is a sheet-iron diaphragm, running diagonally from below the drafthole leading to the flue, upward and toward the front of the stove. The gases produced by the combustion, the smoke and the heat, instead of passing immediately to the drafthole and to the flue, are compelled to make their way up in front, then around the edge of the diaphragm, then down in the rear of the stove, to the drafthole. On their way out they heat a greater surface of the metal of the stove, giving it greater heating power without increasing the amount of fuel used.



The hot gases of combustion and the smoke cannot reach the flue without passing around the diaphragm of this stove

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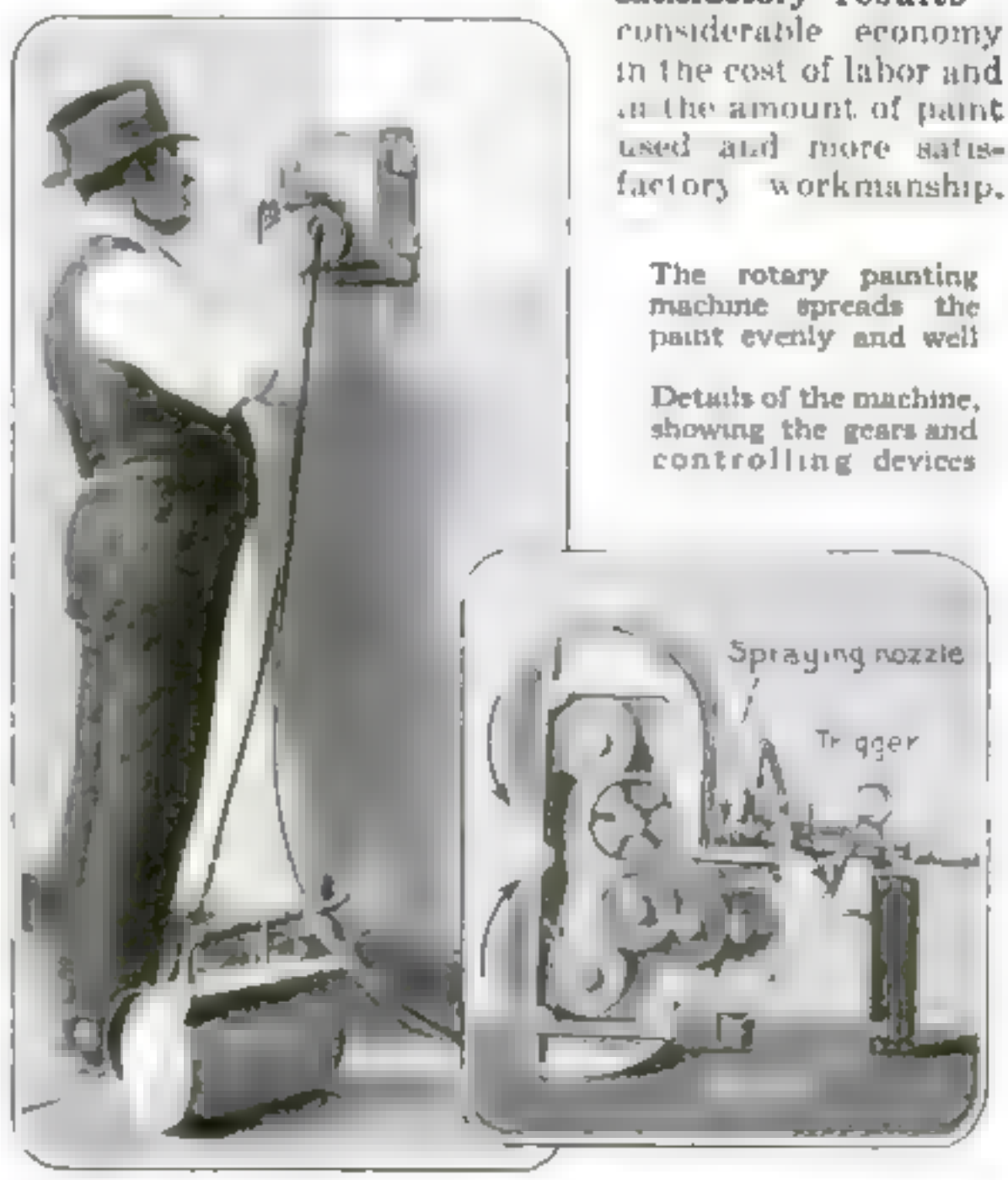
Paint That Barn by Machine

MR. F. L. BENEDICT, of Baltimore, has perfected a device for spraying paint and distributing it over a surface by means of rotating brushes.

The device consists, in its main features, of two rotating brushes with a space between them, sufficient for the paint to be sprayed on to the surface to be painted. A nozzle provides the means for spraying the paint. The brushes are rotated by a small turbine engine operated by compressed air, which is also used to force the paint to the nozzle and to spray it. The engine is connected with the brushes by a chain of gears. The flow of paint and of the air for the sprayer is regulated by a valve operated by a trigger combined with the handle. The brushes are covered with an aluminum case and rotate towards each other, by which arrangement a spattering of the paint is avoided. The total weight of the device is about six pounds.

Trials with this device have given satisfactory results—considerable economy in the cost of labor and in the amount of paint used and more satisfactory workmanship.



The rotary painting machine spreads the paint evenly and well

Details of the machine, showing the gears and controlling devices

Tilting End-Pieces for Your Eye Glasses

ARE you one of those unfortunates who are compelled to go through life with spectacles before their eyes? If so, a clever little device recently patented, will be of interest to you. The device consists of a friction hinge connecting the end-pieces with the lenses in such a manner that by a slight turning of the frame of the glasses the lenses may be brought into any angle relative to the eyes and held in that position as long as it is desired. The new end-pieces are simple and have no parts that will get out of order.

An adjustable spectacle rim for tilting the lenses to a desired angle

Remarkable Photograph of an Actual Battle Scene

ONE of the most remarkable war photographs taken by the official photographer of the British army in France is reproduced in the accompanying picture from the excellent enlargement, eight by fifteen feet in size, which was recently placed upon exhibition. This picture, probably the largest war photograph ever made, shows a wide portion of the battlefield during the actual advance of the Canadian troops at Vimy Ridge, on the morning of April 9, 1917. The smoke in the background is produced by the counter-barrage of the Germans, which was particularly aimed at a line of tanks. The Canadian curtain of fire has already swept over the battlefield and is no longer visible.

This is probably the biggest enlargement ever made of a photograph. It shows the Canadian advance at Vimy Ridge and measures eight feet in height and about fifteen feet in width

The Traveling Brush-Burner. Orchardists Please Notice

ONE of the simplest and yet the most convenient devices built for orchardists is the sheet-iron brush-burner built by Wm. Miller, of Gypsum, O. Mr. Miller had this constructed for use in his own orchards and therefore did not have it patented. In consequence fruit growers are helping themselves to the result of Mr. Miller's thinking.

This portable brush-burner saves much time in hauling and provides valuable potash for the proprietor

The burner is made of one-sixteenth inch sheet iron, riveted together as shown in the accompanying photograph. It is practically a large cylinder with top open and both ends closed. The top is opened the entire length, but just wide enough to admit the brush. The heat is forced upwards, rather than outwards, thus preserving the nearby trees.

This burner is mounted on sled runners. After an orchard has been pruned, the men drive through the orchard with a big blazing fire in the burner. The brush is burned as they drive along. In this manner much time is saved. When the burner gets full of ashes, the owners have at their command a product that ranks high in potash, a scarce yet necessary fertilizing element, — that this apparatus effects great economies.

Static Electricity Drawn From Paper by Alternating Charge

ONE of the most annoying sources of trouble to printers is static electricity in the paper. It causes the sheets, during the process of printing, to adhere more or less firmly to the cylinder or the delivery mechanism of the press and to other sheets. The speed of the work is reduced, exact registering is made practically impossible and even stacking, whether by hand or by machine, a matter of the greatest difficulty.

An electric neutralizer has been invented which completely does away with all trouble from static electricity. It supplies an alternating charge of electricity by means of a small motor generator which gives an alternating current at about a seventy-volt pressure. This in turn is passed through a transformer where it becomes a current of high pressure and small quantity, ready for delivery to the paper through distributing bars on the press. These bars are composed of a number of fine metal points set in porcelain insulation. A bar is located near the cylinder and drop guides and, if necessary, one is attached to the delivery. As the sheets pass under a bar the charge of static electricity is drawn out.

Static electricity is solely responsible for the difference in appearance

Here's the Way to Acquire Pickford Curls

FEMININE hair is usually curled by "kid" curlers. That designation has no reference to the age of the young lady but to a type of construction involving kid leather wrapped about and sewn upon thin flexible metal rods. The leather rods are wrapped about strands of hair at night. In the morning the rods are removed. Curls have grown about them overnight. But at what sacrifice to the youthful wearer! Kid curlers form hard lumps about the head, and hard lumps are painful. Sleeping with one's hair done up in such barbaric fashion is comparable to reposing upon a pillow covered with small hard rocks, which is not conducive to sleep.

But along comes Miss Ella M. Pickard, of Oklahoma, who has found a way to obtain the Mary Pickford curl without the discomfort. Miss Pickard has applied for patent rights upon a hair curler which, to our first horrified masculine glance, appeared to be a fat Havana cigar dangling from a young lady's scalp. Closer inspection brings to light a roll of soft cloth, having at either end narrow cloth straps.

The young lady who is about to enhance her crowning glory simply gathers the strands of her hair together, wrapping them snugly about the soft cloth rolls. The narrow straps are then brought together at either end of the rod, serving to hold the curl in place. When sufficient curls have thus been set in process of manufacture, she retires. The softness of the rolls prevents sleeplessness. And in the morning Mary Pickford has another rival. Painless dentistry has nothing on painless hair-curlers.

Mary Pickford curls are produced by this curler

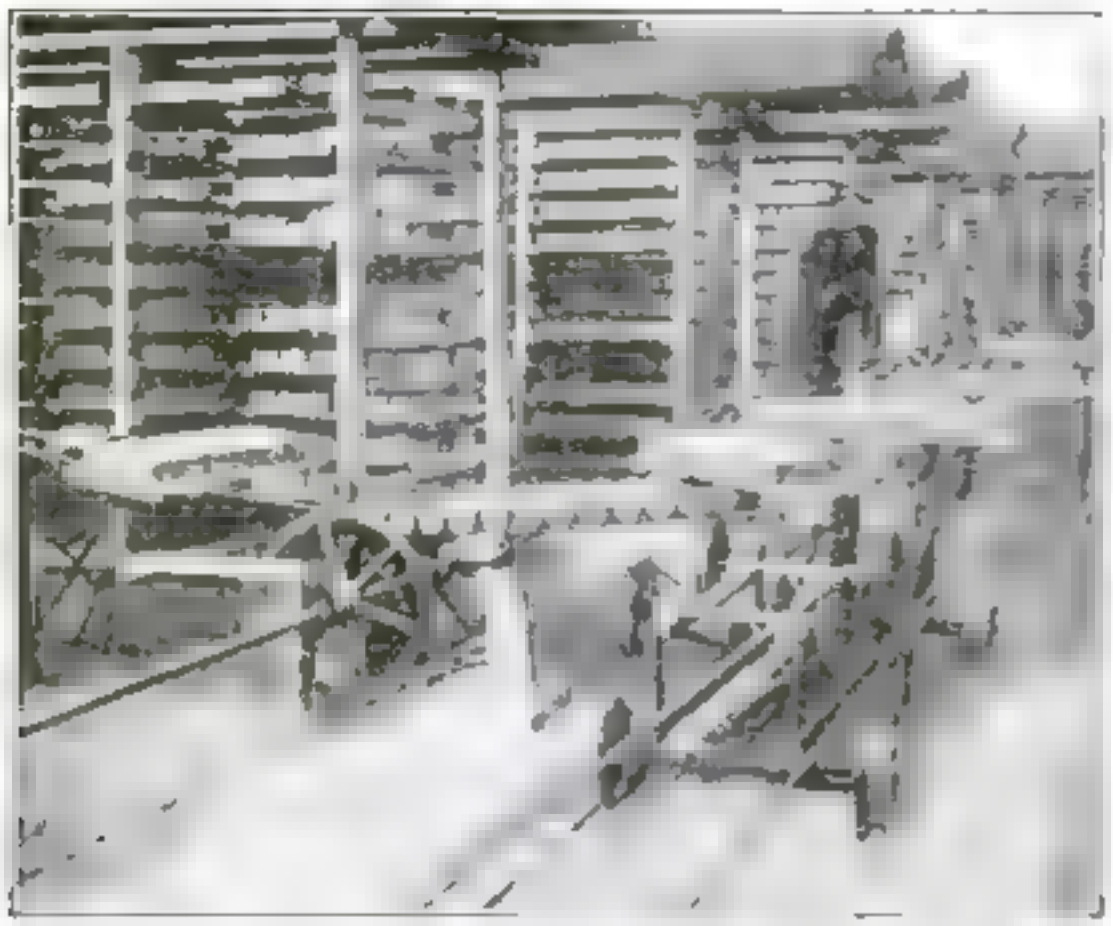
This fountain is a by product of saving the trees from destruction by building an "island" around them

Los Angeles Values Her Trees and Conserves Them

WHEN the city of Los Angeles recently cut North Broadway through Holgate Square there was a clump of fine old pepper trees directly in the path of the grading. So the city, rather than cut the trees down, built an "island" around them. An unusual feature of the island is an ornamental drinking fountain which was built for the purpose of supplying thirsty motorists and pedestrians with a refreshing draught of Adam's ale. The water is piped to the fountain from a street main.

The Life of an Airplane Is Short

THE number of German airplanes destroyed by the French aviators and the members of the Lafayette escadrille for the ten months ending October, 1917, was one hundred and twenty over the French lines, and three hundred and ninety-seven over the German lines—all total wrecks.



This brick-conveyor is worked on a similar principle to the familiar cash-conveyor of the department stores

to the drying shelves extending over the yards.

The mechanism is so simple that it cannot easily get out of order. It requires but little attention and practically eliminates the necessity of employing wheelers and truckers, who are generally considered the most uncertain and annoying labor in the yard.

In these present topsy-turvey times, when men have to be done without and women have to step more and more into the men's shoes, labor-saving machinery of this kind assumes an importance that it never did in the piping times of peace.

Brick Manufacturers Find This a Great Labor Saver

THE conveyor system illustrated in the pictures has been installed in many brick-yards in various parts of the country, and, as the owners of the yards willingly testify, has proved a valuable labor-saver. It is estimated that for a yard with a capacity of about 50,000 bricks the installation of this conveyor would mean a saving of four or five men. The system is simple and, in a general way follows the idea of the cash and parcel conveyors used in many department stores. Two endless wire cables, running parallel and supported by grooved wheels form the basis of the conveyor. The cables are stretched taut so as to support the conveyor planks and the bricks placed upon them. The tension of the cables can be regulated by a screw. By an ingenious switch arrangement provision is made for the turning of corners by the conveyor planks loaded with bricks and for the distribution of the bricks

Protecting the Aviator's Camera Bellows from the Wind

TAKING photographs from an airplane with an ordinary folding pocket camera is utterly impossible if the leather bellows is not protected from the wind, as the aviators are exposed to the terrific draft created by the revolving blades. Add to this the breeze created by the machine flying along at ninety or one hundred miles an hour and you can see why, if an ordinary folding camera is unfolded in an airplane, the wind immediately flattens the leather bellows.

Aluminum case prevents wind in airplane flattening bellows

To overcome this difficulty and to be able to procure a series of aeronautical photographs John Edwin Hogg, of Los Angeles, California, constructed the aluminum bellows shield illustrated. It worked perfectly, and with it he procured the photographs desired. The shield weighs four ounces, and when folded can be carried in the coat pocket. It may be very quickly adjusted.

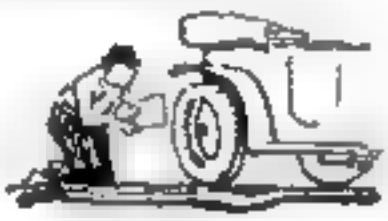
Some Do's and Don'ts for Automobilists

Economy is in the air these days. To automobilists this means saving fires, gasoline, oil, and everything else

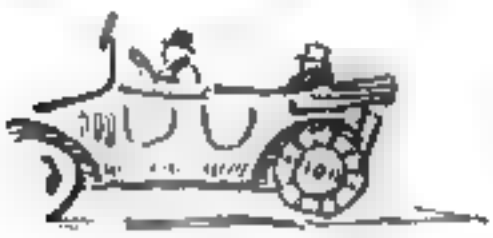
Don't keep your engine racing and banging away when you are waiting for traffic to move

Don't engage your clutch sharply, apply your brake harshly, or round corners too fast

Don't adjust non-skid chains so loose that they fall off, nor so tight that they won't take hold



See that your tires are giving you service. Keep records of them and compare with others



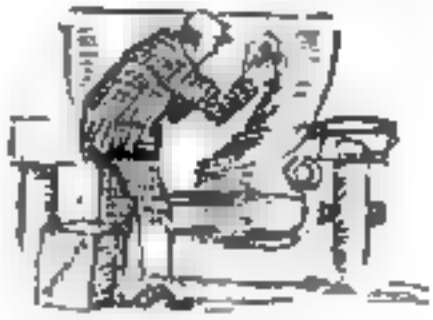
Don't use chains on dry days to tear up the roadway; the Roads Committee will attend to all that

Drive with spark advanced as far as possible without causing your engine to labor, knock, or miss

Inspect oil level in engine, amount of water in radiator, and tire pressure every time out

Study your car. Learn all its ins and outs and how to make minor repairs. You will save money

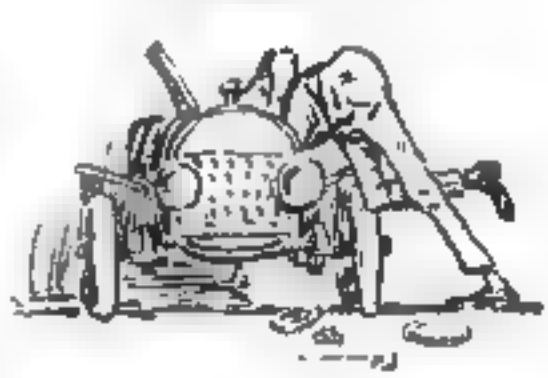
Don't wait until small cuts in your tires become gaping rents, have 'em fired before that



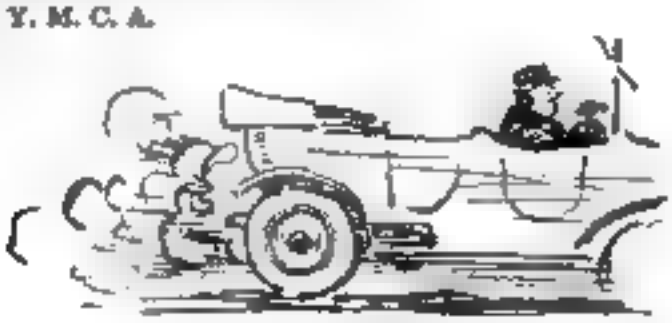
Don't wash your car with gasoline. The method is wasteful, very dangerous, and very foolish

Courtesy of Y. M. C. A.

See that brakes and brake linings are all in order. You may need them in a hurry on some fine day

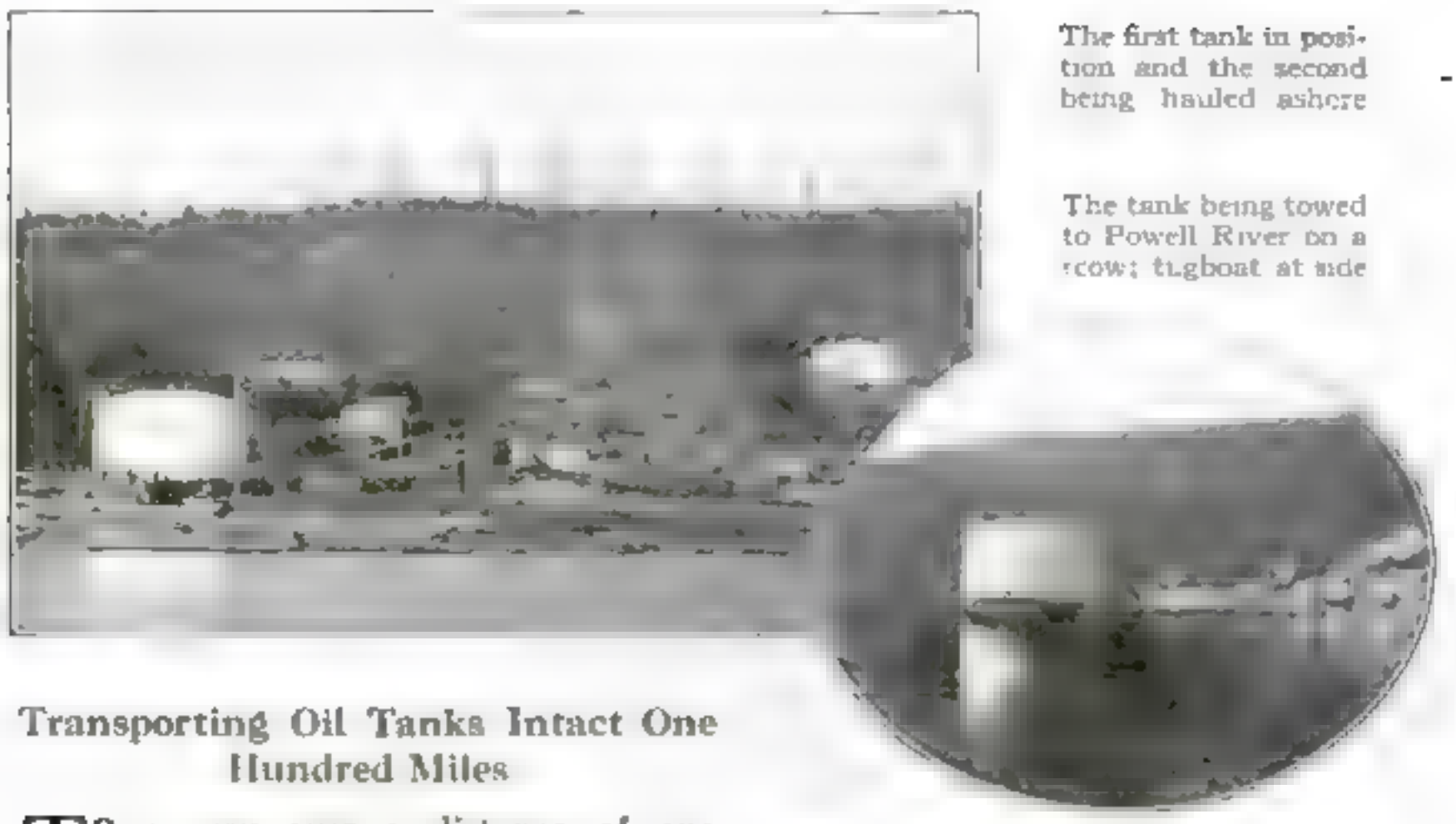


Don't pull your engine to pieces for the mere joy of the thing. It's not a clock and you're grown up now



Don't over-lubricate your engine and drive with the cut-out open. It's noisy and smelly

It's cheaper to cover the radiator or to use non-freezing mixture than it is to leave engine running



The first tank in position and the second being hauled ashore

The tank being towed to Powell River on a scow; tugboat at side

Transporting Oil Tanks Intact One Hundred Miles

TO convey over a distance of one hundred miles three big oil-tanks weighing in the aggregate two hundred and ten tons, without taking them to pieces, was the novel engineering feat accomplished on Vancouver Island, by Mr. S. Doe, a Victoria contractor. They were located twenty-two feet above tide-water at low stage. In order that they might be transferred to scows, trestles were built about one hundred and fifty feet from the shore line, and the whole structure to be lowered in sections. Thirteen foot poles were fixed on the scows and then run under the tanks as they rested on the trestle at low water. When the tide was at its highest the upper part of the trestle was removed. When the tide receded the tank rested on a lower elevation. This performance was repeated three times before the tank was on the scow. The tank-laden scows were towed to Powell River, where in the meantime another trestle had been built out from the shore to receive the tank at high water.

The final operation was not without its difficulties. The foundations for the tanks were more than 600 feet up a ten per cent grade. A track was built and the tanks pulled up the hill by an engine.

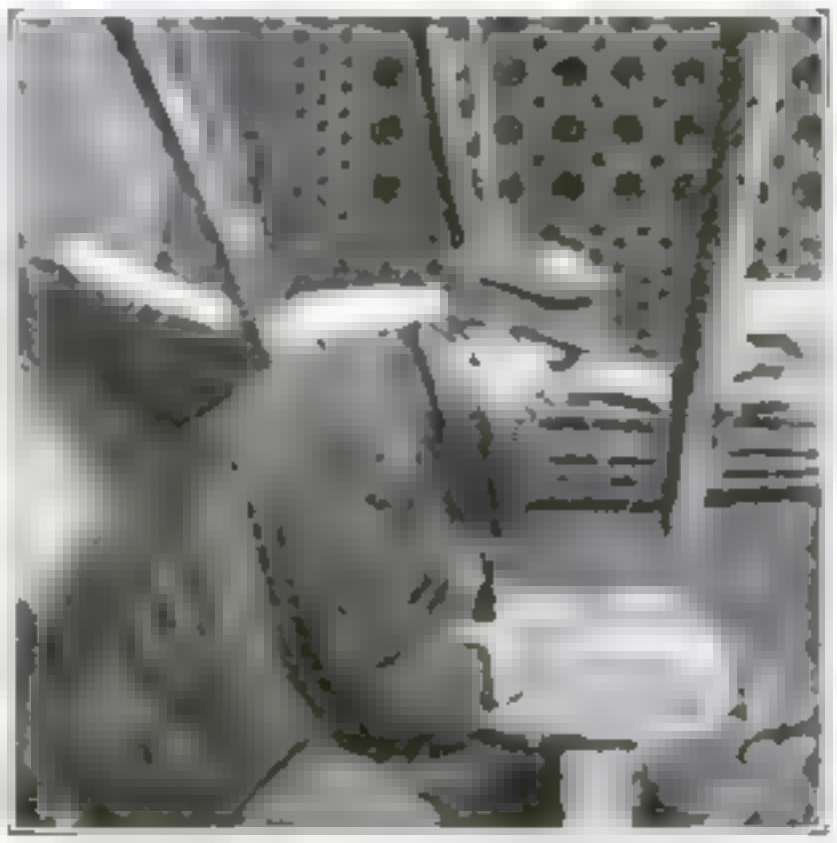
Have You Got Any Use for an Abandoned Locomotive?

ABOUT twenty-seven miles from Yuma, Arizona, a sorry looking locomotive has been abandoned in the Colorado Desert. The engine was left at a gravel pit, and a flood swept away most of the track between it and the main line. Inasmuch as the locomotive is worth but ten thousand dollars and the cost of rebuilding the track would be something like fifteen thousand dollars, it is obvious that it will not be reclaimed. All parts of value that could be moved readily were stripped off, and the engine left to its fate. Standing out prominently in the sandy expanse, it is an object of considerable interest to the curious.

Cost of engine, $10,000. Cost of track to rescue it, $15,000. Result, engine abandoned to its fate

Handling Hot Firebricks with Asbestos Mittens

WHEN it becomes necessary to repair the firebrick arch in the fire-box of a locomotive the fire is knocked out and steam blown down to about half-gage pressure. Then the blower is turned on and a man enters the fire-box to make the necessary repairs. The heat is intense and is bearable for a short time only owing to the stream of cold air blown into the fire-box by the blower. The man must handle the hot firebricks quickly, yet gently enough to prevent their breakage. To enable him to do this he wears mittens of canvas with a protective layer of asbestos on the palm side to avoid burning his hands.



Asbestos lined mittens enable the man to remove and handle the hot firebricks

These mittens can be made for about thirty-five cents a pair, and some of the large railroads have introduced their use as a matter of economy. Fifteen locomotives can be repaired before these gloves wear out, so that the cost for each locomotive is about two and one-third cents. This is a profitable investment. The injury to the hot firebricks, when carelessly handled, as they would be without gloves, would represent a loss many times greater than the cost of the mittens. In fact it would be very difficult to handle them at all, since the bricks hold the heat for a long time.

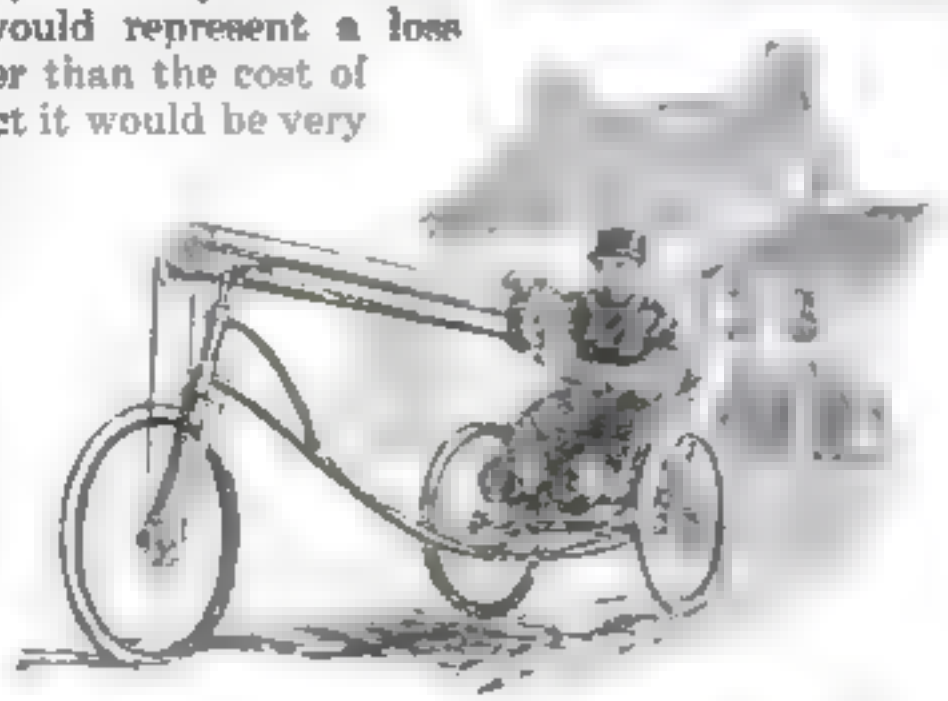
Asbestos is becoming more and more a necessity in modern industry, both for small conveniences and large apparatus, and this is only one more use.

Telephone and Telegraph Service in Argentina Held Up by Spiders

DURING the dry season in Argentina a certain species of spiders' webs collects on the telephone and telegraph wires in enormous quantities. As soon as the sun sets they become soaked with dew and cause short circuits between the wires. Eleven pounds weight have been swept from four wires over a distance of six miles.

Legglessness Is No Drawback

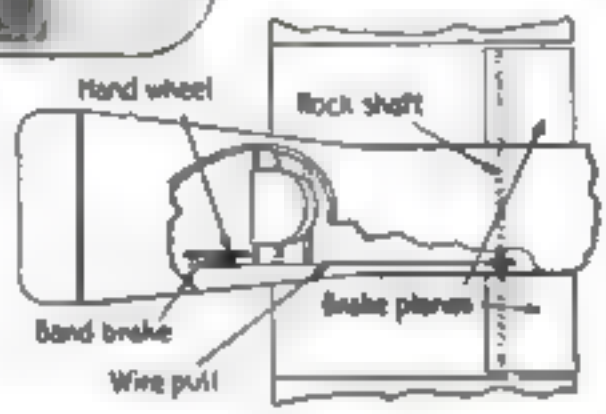
THE Frenchman is nothing if not ingenious. Here is a *poilu's* answer to the embarrassing question of how to do without legs. It consists of a kind of tricycle with very exaggerated handlebars, and a wicker seat, comfortably mounted on springs between the two back wheels, in place of a saddle. The driving mechanism is represented by a regular bicycle driving-wheel, having handles instead of pedals, mounted between the long handlebars in easy reach of the seat. This drives a countershaft, having a sprocket at each end, by means of a long chain, which, in turn, is connected with the front wheel by a shorter vertical chain and sprocket. Steering is accomplished in the same manner as steering a bicycle.



Who needs legs anyway? This novel vehicle is a poilu's idea for circumventing legglessness

It is said that this machine will make fifteen miles an hour on a good road with a husky, legless "engine." It is thus shown that even legs are not really indispensable.

The illustrations show the detail and operation of a new braking mechanism that it is proposed to fit to airplanes so that they may be handled more easily



Braking an Airplane While Flying

A BRAKING mechanism for airplanes has recently been introduced. This consists of two rectangular planes of small area, mounted on a shaft that runs along the rear edge of the main plane, and passes through the fuselage. The control is by means of a handwheel and connections, which act in conjunction with a hand-brake.

When an airplane is flying at a rate of a hundred miles an hour, the air pressure is not less than thirty pounds to the square foot. It will thus be seen that the added resistance of a few extra square feet of canvas has a very great retarding action on the speed of the plane.

Even the Laundrymen Are Affected by War Conditions

NOW it is the laundrymen's turn to feel the pinch of war conditions. They formerly used caustic potash in combination with soap for bleaching purposes. But now that potash is almost unobtainable, a good substitute has become necessary. The recent increase in the price of soap has made the need acute. And now comes a satisfactory domestic bleach. Three pounds of tri-sodium phosphate to twenty-five pounds of soap is the formula.

War Sees Return to Ancient Weapons

ONE of the remarkable features of the present world war is the revival of weapons, methods of attack and of defence which originated a long time ago. Trench warfare is nothing new, but merely a modern elaboration of one of the oldest methods of defence known. The steel helmets, shields and breast plates adopted by practically all of the armies engaged in this war are adaptations of types that had been in use long before the birth of Christ. The illustration shows another revival. The French soldier pictured is in the act of throwing a hand grenade into the German trenches, perhaps only fifty or sixty yards distant. These hand grenades, which are extensively used in trench warfare, are terrible weapons. They are filled with the most powerful explosives and great care must be taken to prevent their premature explosion.

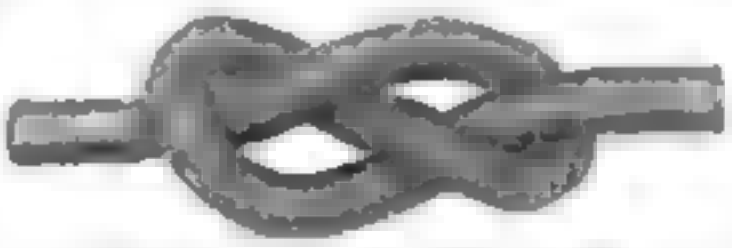
© Kadel and Herbert

Hand grenade, shield, steel helmet—mediævalism personified. Nothing is new

As Flexible as India Rubber but Infinitely Stronger

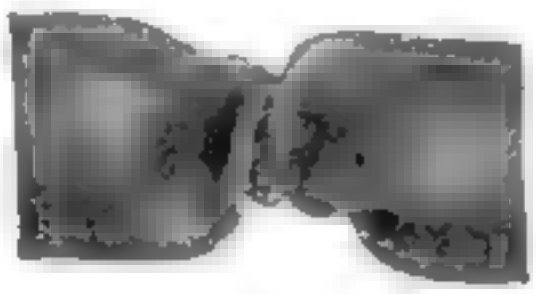
A WONDERFUL pipe-metal is now in use which seems to be able to stand any amount of rough usage. Our illustration depicts instances of torture to which it has been subjected without destruction. The section that looks like a piece of crumpled rag was in an Oklahoma oil well when it was "shot" with one hundred and seventy quarts of nitro-glycerin. It shrank from eighteen feet to six feet in the process, but declined to break.

This piece of pipe was originally eighteen feet long. Nitro-glycerin crumpled it up



This pipe has a tensile strength of 58,000 pounds to the square inch

The twisted piece is a section of eight-inch pipe, weighing about twenty-eight pounds to the foot, and having walls five-sixteenths inch thick. As a pipe it is not of much further use, but as a proof of metallic strength it is a masterpiece. The figure-eight knot is tied in a pipe having a tensile strength of fifty-eight thousand pounds per square inch.



713,000 inch pounds twisted this without fracture

These are only typical instances of what this uncanny metal will withstand. A twenty-six-length pipe, five hundred feet long, was blown bodily out of a Texas gas well. It lay across the landscape, twisted and turned like a gigantic frozen snake, but all its welds and joints, and the metal itself held on like grim death. The joints held, the welds held, and the metal itself was intact. There was not a break or flaw anywhere throughout its great length. As will be seen from our illustration, it is twisted and contorted like a garden hose, and when one considers that it is welded metal it is indeed wonderful.

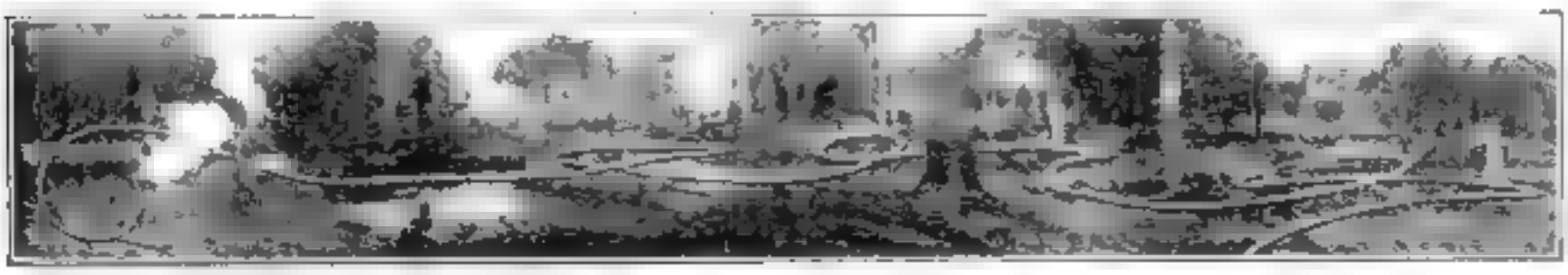
Lengthen Your Cast with the Mercury Fishing Line

A NOVEL improvement in fishing lines is one which is made half of mercury. The process by which it is prepared is one which makes the fibers of the line absorb a mercury compound. This compound is many times heavier than the fiber of the line itself, so that the finished fishing line will be considerably heavier, though of even less diameter, than the ordinary.

A plain fiber fishing line of relatively small diameter is immersed in a bath containing a mercury compound. The mercury is then made to precipitate out of the solution and in through the crevices between the fibers. The fishing line is next taken and dressed with a mercury ointment. When this dries, the thin fishing line will be coated with a smooth, glossy surface. Then when the line is cast the friction between it and the rings of the fishing rod, as the line plays out, is much less than with other lines.

Moreover, the smaller diameter of the line makes the resistance of the air upon it less than in other cases. The drag of flowing water will also be reduced. Therefore not only will the cast of a line be greatly lengthened with this line, but, in addition to this, the line will "stay put."

Now, all you disciples of Ike Walton, here is a new departure. Try it out on your next expedition after the fickle trout or black bass. We stake an editorial blue pencil, though, that you're scared to try it out on a "musky."

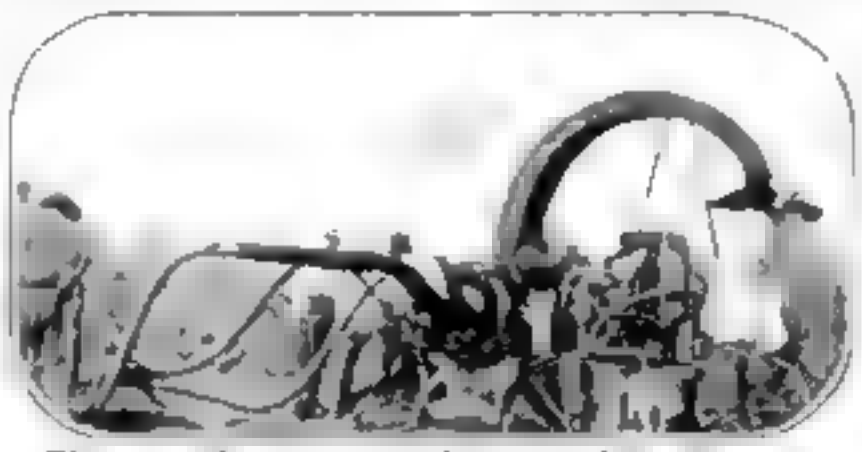


Lying like a gigantic frozen snake across the landscape, this piece of pipe has all its joints and welds unbroken after being blown bodily from a gas well in the southern oil fields

Picking Cotton with a Vacuum Cleaner

This machine does the work better, quicker, and without the waste of hand pickers

ACCORDING to Government figures, hundreds of millions of dollars are yearly wasted by the careless picking of cotton. In some cases 50% of the crop is left on the plants. That explains the two thousand patents for mechanical cotton pickers that have been taken out. Not one of the inventions disclosed has proved commercially successful. About a million persons are still engaged in the picking, ginning, baling and transporting of the white fluffy stuff that goes to make up everything from gun cotton to our "pure silk shirts" and other daily necessities.



Showing the cotton-picking machine in operation. Note the compactness of the cotton

As an article of commerce, cotton was almost negligible until Whitney invented the cotton gin in 1793. The American production of cotton, which was only two thousand bales in 1791, was instantly stimulated, with the result that in 1801 it had risen to ninety-two thousand bales. Since then, it has shown a constant increase, interrupted only by the Civil War, during which time, of course, but little cotton was grown in the states of the Confederacy.

During the present war, cotton has come to the front as a very important factor in the actual winning of the war. Not only is it of importance in the textile industries, but more particularly in the manufacture of explosives.

Down in the new cotton country of the Imperial Valley, a reclaimed desert of Southern California, there is now working a cotton picking machine that has already outclassed the hand pickers. What is more, the cotton it picks is even cleaner than that of the hand pickers' baskets.

The machine—called the Gabel-Holdaway—consists of a light steel chassis, supported on three steel wheels for the sake of easy handling. On the chassis supporting is a sixteen horsepower gas-engine, which drives a suction pump and a centrifugal separator. A light steel pipe runs across the machine, and from this run five eighteen-foot light rubber pipes, terminating in the peculiar picking nozzles, which the inventor claims are the reason for the success of the machine, together with the centrifugal separator.

Five men, one at each nozzle, are all that are necessary to carry out the picking

Five men operate the nozzles, one to each. The pump sucks on the hose. The manipulator of the nozzle merely sweeps it across a row of bolls, and the white fluffy cotton is sucked into the nozzle and then through the pipe to the separator. Here the cotton is separated from the incidental leaves, and from the motes. Next the

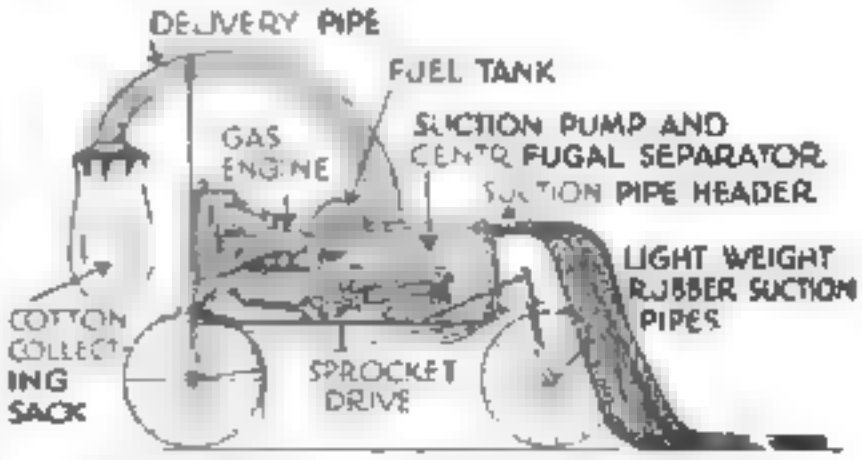


Diagram showing details of the cotton-picking machine, which is not very complicated

cotton is blown through the pipe running to the rear of the machine, where it is caught in sacks or baskets, while the finely broken up leaves and dirt are blown through openings in the pipe by which the cotton passes in its course.

Working ten hours a day, the machine is stated to pick one thousand pounds per nozzle, or five thousand pounds per day in all. Hand labor picks about one hundred and fifty pounds.

Weighing but one thousand pounds, the machine is easily moved along by means of a horse. The perfected model will use a transmission arrangement to the rear wheels, and be driven under its own power.

The superiority of the machine over hand labor was plainly shown in the Imperial Valley, where the intense heat makes hand labor hard to obtain, and inefficient when obtained. It proved easier to obtain five men at good wages to manipulate the nozzles than to secure the picking equivalent in hand labor during the hot months.

A successful cotton picker, as this promises to be, means an enormous saving in the cost of cotton production with no lowering of the profit to the planter, and the release of hundreds of thousands of badly needed laborers for other fields of endeavor.

We have heard much lately concerning the migration of the negroes northward. As they are the pickers of the cotton, may not such a machine as this have some little bearing on the future Southern economics?

Here is the gang at work. The pickers are at the nozzles and the machine is standing end on

Grownups who are not still young enough to climb trees are barred from entering

This Tree-House Is in Massachusetts, Not in Africa

A MAN in Salem, Massachusetts, has built a playhouse in a tree for his children. It was given its lofty position in order to add novelty to its other attractions. An old tree with two branches extending straight out in two directions lent itself admirably to the purpose, but in order to make the location doubly secure, props were put under the limbs and a rod was run through the main branch of the tree and through the little house itself to the support in the rear. Thus it was made wind-proof and rigid and firmly supported.

Entrance to the house is gained by means of a ladder, if you are not agile enough to climb a tree. During the summer, when the leaves are on the tree, the children of the family have a delightfully cool and shaded place of their own. Here they reign supreme and can amuse themselves in any old way they wish, without "getting on the nerves" of the grownups.

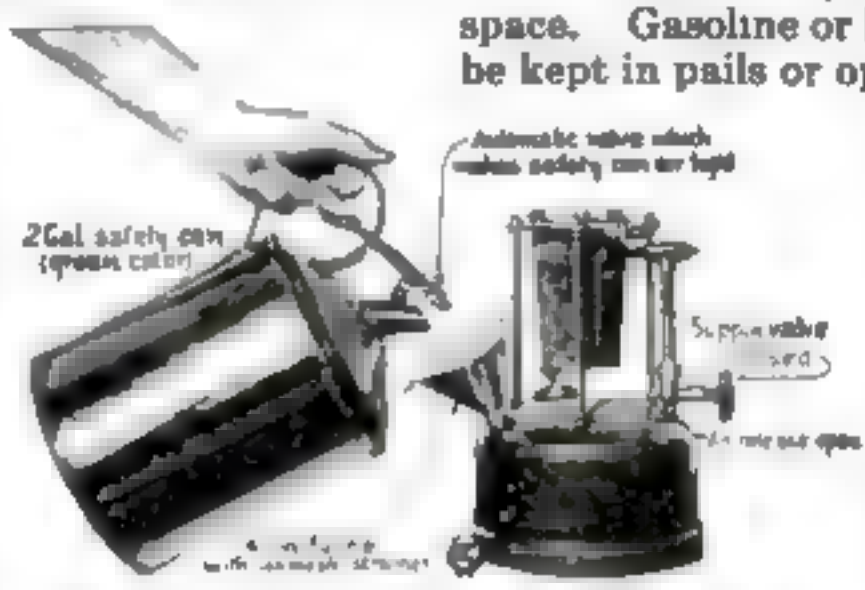
Less Risk in Kerosene Than in Gasoline

But sand or sawdust should be kept near both of them as an extinguisher

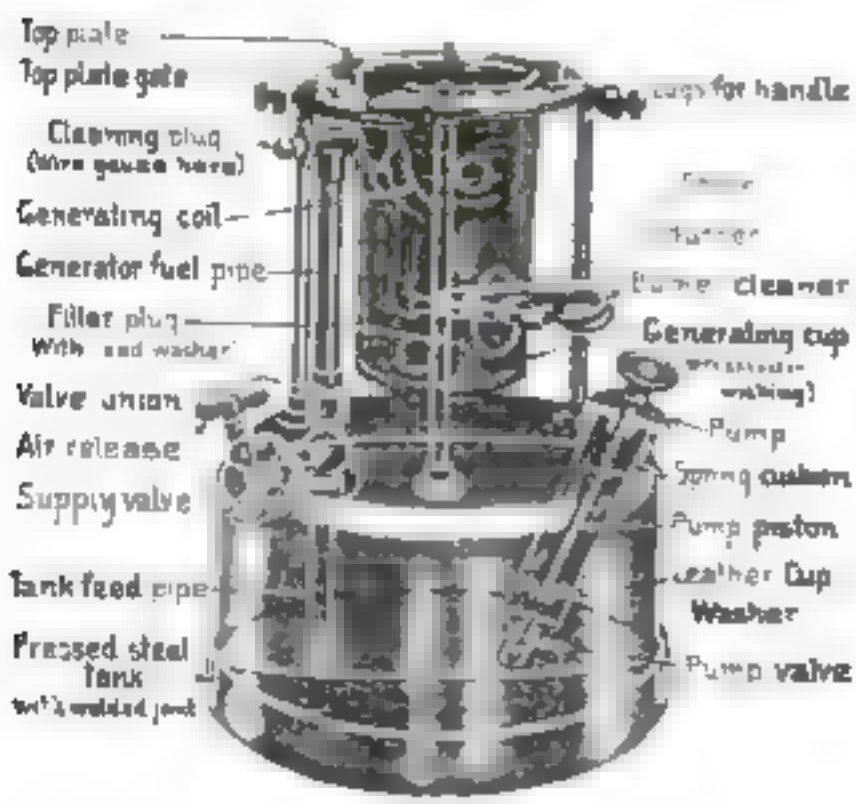
THE vapors of gasoline as well as of kerosene, when undiluted or unmixed with air, burn after ignition gradually and without explosion, but explode with great force when mixed with air in certain proportions. In the case of gasoline there will be no explosion if less than 1.4 parts by volume of gasoline are contained in 100 parts of the mixture, or more than six parts. In the case of kerosene the range of explosibility is very much narrower than with gasoline, and the danger of an explosion, therefore, much smaller.

In practical experience it was found that kerosene is much safer to handle than gasoline, besides being more economical. In many cases appliances formerly used with gasoline have been adapted to the use of kerosene. Among these appliances are furnaces and blow-torches which have been so adapted and are giving satisfaction. They are now extensively used by plumbers, painters and electricians.

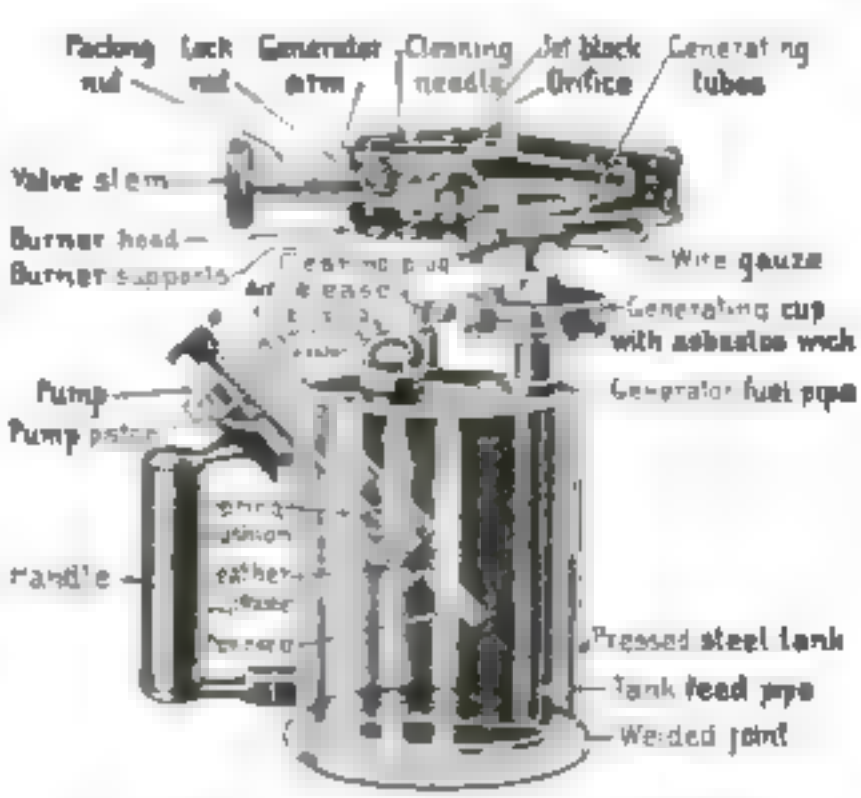
Wherever gasoline or kerosene is used, the greatest precaution should be taken, to prevent leakage or the spilling of part of the liquid, especially in a confined space. Gasoline or kerosene should never be kept in pails or open receptacles of any kind, but in properly constructed safety cans, similar to that herewith shown. All taps to tanks should be fitted with drip pans. Children and unauthorized persons should not be allowed near places where gasoline or kerosene is stored, and the rules against smoking and the use of naked lights in such places should be strictly enforced. Sand or sawdust in large buckets should be kept in all places where gasoline or kerosene is stored or handled, to be used as an extinguisher in case of ignition. Sawdust is not easily ignited and, as it floats upon the burning liquid, it helps to smother the flame. Sand is also good.



Showing the method of filling a modern kerosene furnace from a new safety can



Construction of modern kerosene furnace and parts used in electrical work



Details of a kerosene torch. The high price of gasoline may bring this into favor

No Race Suicide Among the Bacteria

"BACTERIA reproduce with almost incredible rapidity," says George W. Hunter in "A Civic Biology" (American Book Company). It is estimated that a single bacterium, by a process of division called fission (dividing itself into two parts) will give rise to over 16,700,000 others in twenty-four hours. Under unfavorable conditions they stop dividing and form rounded bodies called spores. These are exceedingly difficult to injure or destroy.

© Underwood and Underwood

They will not vivisect him. He tried to argue with the horseshoer, so they had to persuade him

War Provides an Expensive Clothes-Rack

THE queer thing in the middle of the picture, which resembles a monster porcupine used as a clothes-rack, is the stump of a tree which grew "somewhere in France" until a German shell struck it and cut the trunk of the magnificent tree in two. The exploding shell splintered the wood in such a manner that the stump, with its radiating big splinters was used by the French soldiers encamped there as a rack upon which they hung their clothes and military equipment. The rack may be convenient for the soldiers, but this is really too expensive a method of making clothes-racks. Besides, stumps are not always handy, and then the shell may miss them or they may splinter in some inconvenient manner. After all, the regular pattern cannot be beaten for "steady" use.

© Underwood and Underwood

How a German shell provided a very convenient clothes-rack for French soldiers

Army Horses Must Be Good-Tempered

IT'S a weary, wicked world if you are an army horse. You may or may not approve of shoes, but you've got to have them just the same. The French authorities have an ingenious contrivance which so pinions a horse that he has absolutely nothing to say in the matter. It holds his head, and holds his feet and holds his body, and forcibly prevents him from expressing an opinion, or choosing his shoes, or making a protest in any way. If they would only let a fellow get in just one real horse-size kick one could—but what's the use. In the meantime the farrier gets in his fine work, and then it is too late. Yes, it's a hard, cold, cruel world, so it is! Still, shoes are not so bad and they give a dandy heft to one's hind hoofs in arguments later on in the camps.

Where the ways of the little raindrops part—westward toward the Pacific, and eastward toward the Atlantic

Marking a Point on the Continental Dividing Range

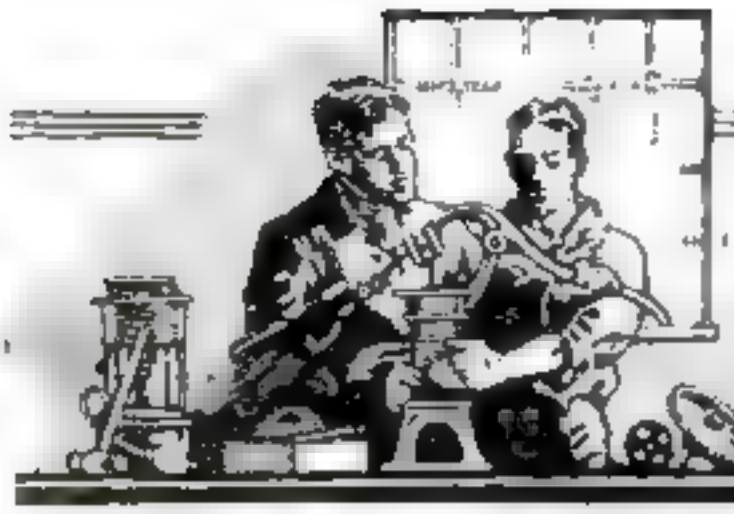
THE big sign shown in the illustration was erected by the State of New Mexico to mark an interesting point of the continental divide. It stands near Corona, N. M., on the transcontinental highway, and attracts much attention from tourists traveling over that road. It marks a point of the continental water shed, and its position is such that the rainwater which falls on the west side of the sign flows toward the Pacific Ocean, while the rainwater falling east of the sign eventually reaches the Atlantic. Of course, there are innumerable such points along the continental divide, but only in a few sporadic cases are they marked for the benefit of tourists. If more points of interest were marked in this way it would add much to the pleasure of travel.

One Man Handles Collapsible Form

A REMARKABLY clever device has been placed on the market and promises to revolutionize the construction of concrete box culverts. It is a collapsible metal framework in sections, which forms the support of the wooden casing for the concrete. The set of forms for the construction of a culvert, thirty feet long, consists of four sections or units, which are entirely independent of one another. The frame, which is shown in the accompanying illustrations, is of iron, and adjustable laterally and also vertically. Two sizes are adaptable to thirty-nine different culvert openings. One man can set up and remove the forms.

The mechanism is exceedingly simple and easily operated. The units are set up, the casing of matched boards placed over the framework and the concrete is filled in around the casing. After the concrete has hardened, a pull at the cross-bar causes the top supports to fold up, while a pull at the center bar draws in the side sills. This deprives the wooden casing of its support and the boards separate from the concrete and can be removed, clean, uninjured and ready for another job. Trials of the device have shown that it effects a great saving in every way.

This new collapsible, sectional concrete form can be handled by one man with perfect ease



FOR PRACTICAL WORKERS

Birds Take Their Own Picture with an Electric Shutter

TO take animal pictures in the open, the camera is placed where from previous observation the animal was frequently seen. If the animal in question is a bird, the camera is focused upon a nest, or a specially made bird-house or bird bath, which the bird has regularly visited for at least a few days. It sometimes becomes necessary to hide and cover up the photographer and the camera. This may easily be effected by making a frame of slats and barrel hoops, covering it with muslin or sackcloth and painting the structure to resemble either a boulder or a tree-stump. This hollow structure should be large enough to accommodate the photographer with his camera. A few days prior to its being used it is placed where the animals to be photographed are accustomed to come for food so that they may become accustomed to its presence.

A wood thrush, *Turdus Mustelinus*, on a limb

In general it may be stated that no rules can be given governing the taking of animal pictures in their natural habitat. Much must be left to chance, while the imagination and ingenuity of the photographer must be called into play to secure each picture in a different manner, otherwise the pictures, having the same background, might become monotonous. But the fact remains that the animal must always be outwitted in some manner, that its inherent shyness must be overcome by some trick, in order that a satisfactory picture of it may be secured upon the film or plate.

Photographs of animals taken in captivity never give us a complete idea as to their habits. The person desiring to take pictures of animals in their natural environment must thoroughly understand the life and habits of the animal.

The simplest way to secure good pictures of wild animals, is to use some kind of a device with which they may take their own photographs. Pictures taken in this way are almost invariably of the first order because they give clear, sharp and distinct negatives. Secured in other ways the pictures are often blurred and indistinct in detail as well as in outline.

A simple device used to take pictures of birds is shown in the illustration. With this device the birds take their own pictures. Birds, when flying to the ground either for food or for a bath, first hop upon a low branch or projection overlooking the place for which they are

Picture of a catbird on a post where he tripped the release operating electric shutter

flying, undoubtedly to spy out the land and to see that no enemies are in the vicinity. This characteristic of all birds is taken advantage of in this device. A sprig, top of a fence post, brick or stone is fastened to a short movable arm which is in control of the electric contacts. These contacts are adjusted so that the feathery, light body of a bird readily presses the movable arm downward thus closing the circuit which releases the shutter of the camera and the picture of the shy creature is secured.

Box enclosing all the mechanism which controls the electric switch for making contact

The construction of this apparatus is very simple indeed, as can readily be seen from the diagram. An empty cigar box was used for the house. This was securely fastened to a comparatively thick base. Long strips of iron, ¼ in. wide and 1/16 in. thick, were used. Out of this the support *A* was made as shown in the illustration. This projects about 1 in. above the cigar box, a hole *B* was therefore bored. Two holes, *C* and *D*, situated about ½ in. above the top of the box, were drilled into the iron *A*. The arm *E* was then made. This projects 2 or 3 in. beyond the box. This arm also has two holes corresponding to *C* and *D*. A nail is loosely passed through these holes. This forms the axle or pivot for the arm *E*. The arm flaps are bent together and fastened with a U-shaped clip at *F*. The arm carries a block of wood *G* which is fastened just beyond the edge of the box so that it does not come into contact with it. To this block a wire *H* is attached which holds a piece of metal (copper preferable) cut as shown. The loop *I* lets the metal *J* touch both poles, *K* and *L*, which consists of two brass wires 5 in. long. The branch *M* upon which the bird hops, is pressed down. Another piece of metal, *N*, attached at *O* extends to within a few inches of the bottom of the box. This is the balancer or lever arm and may be adjusted by the movable weight *P* so that the slightest pressure at *M* at once connects the metal *J* with the two poles *K* and *L*, thus closing the electric circuit.

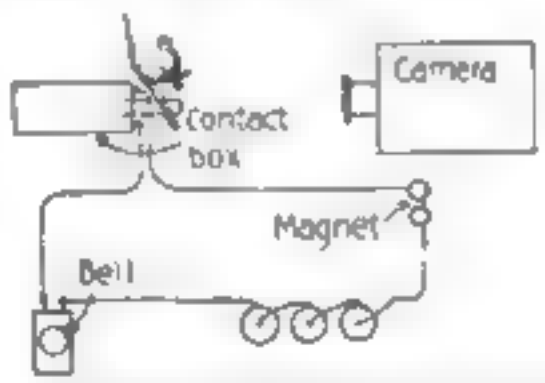


Diagram showing connections for the electric circuit and metal connector in the switch

The camera is placed upon a board which carries the electro-magnets. One pole of the electro-magnet is connected with pole *Q* of the box, while the other is connected with one pole of the battery. The other pole of the battery is connected with pole *R* of the box. When the twig *M* is pressed down, the metal strip *J* makes a contact with both poles. The electro-magnet becomes magnetized, draws the iron core and releases the shutter. Since the graflex has a push button to release the shutter, an angle iron is taken; a knob is placed at one extremity and adjusted so as to come into contact with the button. The other extremity carries a weight which almost counterbalances the resistance of the shutter. A slight downward pressure will now release the shutter. This pressure is supplied by the magnet. For operation of a shutter situated in back of the lens see POPULAR SCIENCE MONTHLY, June 1917.

The camera is focused upon a twig or other object placed upon the arm *E*. The instant a bird hops upon the twig, current flows, the magnet is charged, and draws the angle iron downward, releasing the shutter. Thus the picture is taken. It will be found of great advantage to introduce a bell into the circuit so that it will instantly ring when a contact is made and a picture secured, thus enabling the camera to be immediately brought in.

Holding a Board with the Weight of a Newspaper

A VERY singular experiment can be carried out with a board about 3 ft. long and a piece of paper. A newspaper will do. The board is placed on a table with one-third of its length projecting over the edge. Cover the part of the board that is on the table with the newspaper, then ask one of your friends what will happen if you give the projecting end of the board a sharp blow downward with the fist. Most people will say that the board will spring off the table. But this is just what it will not do. Providing the blow be very sudden, the board will be immovable, no matter how hard the knock may be. The board should not be too wide so that a goodly portion of the paper will lay on the table top.

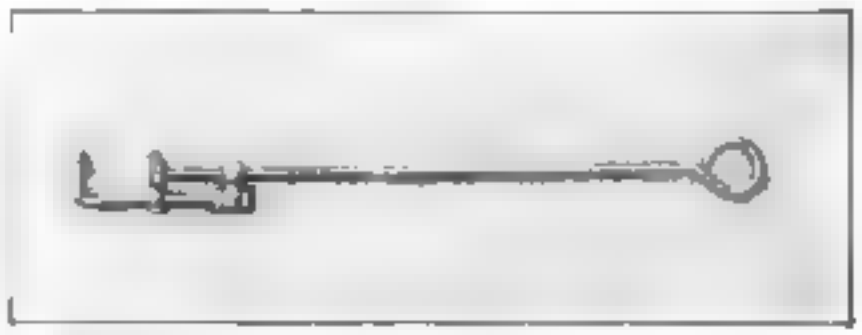
The explanation of this curious fact is to be found in the pressure of the air. It should be borne in mind that in the ordinary way the atmosphere is pressing

The board and the paper as they are placed on the table top for the experiment

on every side of objects on this earth with an even weight. If the board on the table is given a sharp blow, there is no time for the air to rush beneath the paper to the underside of the board which is close to the table. As a consequence, there is a tremendous pressure on the upper part of the board, but none on the under part. This weight of air is so great that the board will break, if the blow is hard enough, before it will jump off the table. On the other hand a slow pressure, even with the little finger, will easily move the board. This is owing to the fact that the air has time, in these circumstances, to pass underneath the board and newspaper—S. LEONARD BASTIN.

A Homemade Wrench for Turning Small Inaccessible Nuts

THE little wrench shown in the illustration was made of an old foot pump handle. The parts being round it was only necessary to drill holes through

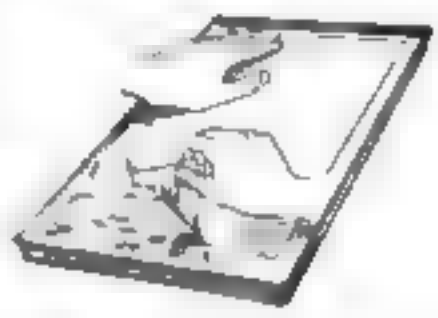


Wrench made from a foot pump rod that will work like an ordinary monkey wrench

the movable jaw and the adjusting clip; then cut threads of the latter as well as on the handle for making the wrench complete. Two nuts hold the adjusting piece on the outer jaw end. This wrench is an excellent one to use when making repairs on an automobile because it turns small nuts placed in places that are otherwise inaccessible.—KENNETH WHITNEY.

Homemade Hectograph for Making Copies of Letters

A COPYING pad is indispensable to those who wish to make a limited number of copies of writings or drawings. One which is practical as well as inexpensive may be constructed in the following manner: Procure 1 oz. of the best gelatine; cover it well with cold water, and allow it to stand overnight, care being taken to see that all of it has swollen. Heat 6 oz. of chemically pure glycerine over a salt water bath to a temperature not exceeding 200 deg. F. The water that has not been absorbed by the gelatine should be poured off, and the gelatine added to the hot glycerine. The mixture obtained is heated for about an hour, and gently stirred occasionally, avoiding as much as possible any tendency of the fluid to froth or bubble. At this point add about a teaspoonful of oil of cloves as a preserva-



The gelatine mixture placed in a shallow pan

tive. It is now ready to pour into the vessel which is to hold it, while in use.

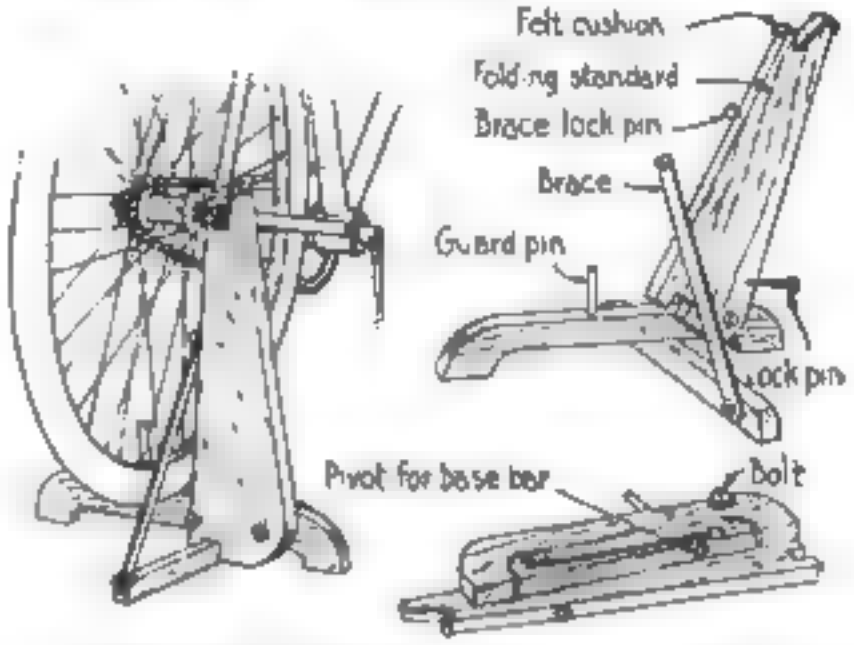
A wooden vessel may be constructed for this purpose, but a shallow cake tin of rectangular shape will serve equally well. The container should be placed on a level surface after it has received the composition, and the contents permitted to cool in a cool room which is free from dust for about 7 hours.

To use the pad it is only necessary that a small wet sponge be passed lightly over the prepared surface. When nearly dry, the first copy may be made. The writing is made in hectograph ink, which may be purchased at any stationery store. It is advisable to use a new steel pen with every original. After the writing has become dry, it is placed face downward on the pad, and the back of the paper rubbed gently to secure perfect contact. In a few minutes it should be removed by placing one hand on the sheet and pulling from a corner with the other. In this manner many copies can be made. When the desired copies have been obtained, the pad should be washed lightly with a sponge moistened with cold water. Lastly, be sure to let it dry before it is used again.—HERMAN NEUHAUS.

A Folding Bicycle Stand for the Home Shop

THIS bicycle stand not only forms a secure means for holding the "bike" in position when not in use, but also has proven itself of wonderful convenience during the arduous operations of cleaning, oiling, and tire inflating. The ease with which the rear wheel and crank shaft may be rotated to reach all parts of the sprockets and chain while the bicycle is maintained in its supported position, as shown in the illustration, make the device particularly useful, and as the stand folds, this removes the objection which its "set-up" bulk might occasion.

The details of the construction are very simple and can be readily understood from a study of the illustrations. The easiest and quickest way to form the three wooden parts constituting the frame is to saw them out of a ⅞-in. board with a scroll-saw, or easier yet, on a band-saw. The angle brace connecting the base and the standard may be formed from a piece of strap iron, or if more convenient, from ¼-in. round iron. When the bicycle is placed on the stand, its weight, as shown, is supported by the upright standard; the felt-covered notch at the top, supporting

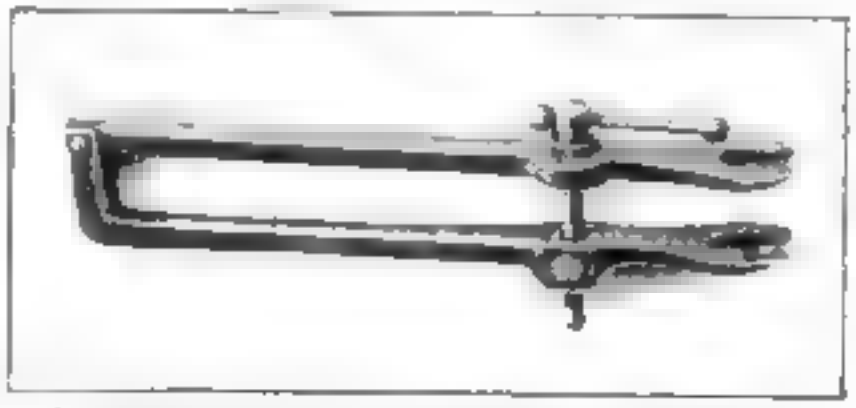


A substantial bicycle stand that may be folded into a small space when not in use

one side member of the rear wheel fork. As the bicycle hangs by one side member, the lower portion of the rear wheel swings, by gravity, against the adjacent lower edge of the standard. To guard against the bicycle being inadvertently displaced from this position, a guard pin is provided in the base. A small stove-bolt may be used to pivotally secure the standard to the base.—J. D. GARFIELD.

A Homemade Lifter for Gasoline Engine Valves

THE illustration shows a lifter made of metal modeled somewhat in the shape of a carpenter's vise. The ends of the jaws are flattened into a wedge-shape and slotted to fit over the valve stem.



A forged tool in the shape of a carpenter's vise for a gasoline engine valve lifter

With the spring between the jaws the screw clamp can be turned to compress it for removing the holding pin. Such a tool can be easily made by the home blacksmith.—N. A. Dow.

Do You Grow Roses? Here Is a Little Information

THE real secret of success in rose culture is watchfulness. The rose, more than any other plant, has enemies which, if given a chance, prey upon it and spoil its loveliness. Therefore, eternal vigilance is the price that must be paid for the rose garden. A long stream from a garden hose to wash off the slugs, hand-picking to remove the chafer, frequent drenching with kerosene emulsion or sprinkling with arsenate of lead to rid the plants of the sucking insects, aphides and thrips—all are necessary at frequent intervals if one would have roses.

Trimming the roses properly. A bank of memorial roses and those hardy climbers, the sweet multiflora roses

Such care would be too tedious were it not a labor of love. For that reason it has been said that the first requisite in preparation of a rose garden is a special love for the flowers. The second requisite is plenty of space. The rose is aristocratic. It does not like to be crowded in with mixed company. Where roses are cultivated for the sake of the cut flowers they should be planted in rows far enough apart to permit of cultivation with a horse-drawn plow. And they should be cultivated often—not merely two or three times a season. Cultivation should be continued up to within a few weeks of the dormant period.

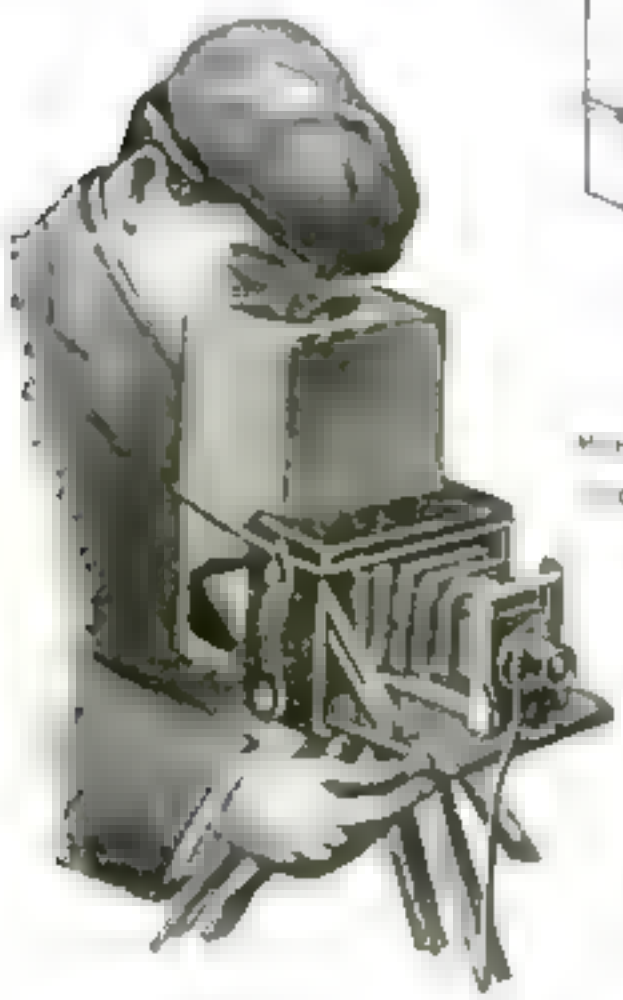
Roses are propagated from seed, from hardwood cuttings, softwood cuttings, layers, budding and grafting. The most common method is to use hardwood cuttings. Good, strong, well-ripened shoots of the past summer's growth are selected. These should be cut between the time the leaves fall and freezing weather. They should be cut into lengths of 5 or 6 in., with the upper cut just above a bud, and should be tied in bundles with raffia or with string that will not rot easily if exposed to dampness. After they have been labelled plainly they should be buried in moist sand, tops down, and placed in the cellar. If buried outside, they should be placed deep in the ground, below danger from frost.

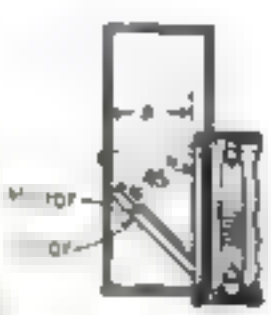
Jar covering cutting to prevent evaporation and a rose pruned to an advantageous height

Where only one or two cuttings are to be rooted, an inverted glass fruit jar may be placed over them for protection. When roots have begun to grow, the plants should be permanently set in good, watered soil and shaded for a few days from the noonday sun.

A Reflex Attachment for Use on a Hand Camera

AN extremely simple focusing device which actually transforms the ordinary view camera into a reflecting camera, is made from card-board or ordinary box-board, and is readily secured to the





Cardboard box used on the back of a regular camera for reflex attachment

camera by a stout rubber band, no other fastening being required.

The simplest way to make this device is to make a paper box (or to have it made in a paper box factory) with the sides and ends entirely closed in, and lined with black paper. The height of the box should be about 12 in., whether for a 4 by 5, or 5 by 7 camera.

The width indicated in the sectional view of the illustrations by X, should be determined by measuring the distance from the upper edge of the focusing door, when it is swung back exactly 45 deg., to the rear of the camera (the entire width of the box in this direction should be the distance X, plus about 1 in. more). The lower front portion of the box is now cut away, back to the measured distance X, as shown. Next the sight opening at the rear top edge of the box is cut out, as seen in the perspective view, and the box is ready for use. The reflecting mirror, which should be about the size of the focusing door, may be attached to the box in any suitable manner.—JULIUS D. GARFIELD.

Fastening a Breather Cap Securely to Prevent Its Loss

THE breather cap on an automobile engine is very easily lost, especially when the car has been in use for a considerable length of time. This is due, in many cases, to the thread on the inside of the cap wearing out and losing its holding power.

Notches in cap to hold it

To eliminate losses of this nature, remove the threads from the inside of the cap, by turning them out on a lathe. Then insert two headless ¼-in. machine screws in the upper end of the breather pipe. Provide two slots in the cap of sufficient size to clear the two set screws.

Merely drop the cap over the pipe and then turn in a horizontal direction. The two set screws entirely eliminate the possibility of the cap coming loose.—ADOLPH KLEIN.

Spreading the Air Currents from a Desk Fan

THE oscillating electric fan costs almost twice as much as the regular fan and the air currents from it are not steady and uniform, the breeze being driven first in one direction for a short time, immediately changing to another direction. The illustration shows a new device that spreads the air quite evenly all the time. This device consists of a number of metal plates, clamped together at the angle desired, and attached to the wire protector in front of the fan. The plates, which are evenly spaced in a vertical plane, divert the air currents steadily to the parts of the room where ventilation is most needed.—J. G. PRATT.

Air spreading wings fastened to the fan

Open Canoe Cruising

II. -Description of the lateen rig and why it is best suited for the open canoe for cruising, sail-making, masts, etc.

By E. T. Keyser

THE canoe lateen, when set, resembles a leg-of-mutton sail. Its advantages over the leg of mutton type are that it requires a shorter mast, needs no mast hoops, which are prone to jam, and that the peak sets far enough aft of the mast to give good driving power. For open canoes this is the best all-around rig, as its simplicity and compactness more than offset, for the open cruiser, the greater driving power and increased windward possibilities of the batswing type of sail.

A given area divided into two sails is preferable than the same area in a single sail, as it allows of carrying a pretty fair spread of canvas in light weather and reducing to the minimum—the mizzen alone—in heavy winds. For a 17-foot canoe, an area of 68 sq. ft. will be about right. If the skipper is very light in weight, or the canoe be of 15 or 16 ft. length, a total area of 52 sq. ft. will suit conditions better.

A canoe equipped with two lateen sails, which make the best all-around rig for an open cruiser

The forward or main mast should be stepped just aft of short forward deck. The after, dandy or mizzen mast, at forward side of after seat. This arrangement calls for ⅓ of total sail area in mizzen and ⅔ in main sail. For a rig of 68 square feet, lay off on a floor with a chalk line a base line 9 ft. 3. in. long, as shown in Fig. 6. From right end of base line describe a circle with a radius of 10 ft. 6 in. From left end of base line describe a circle with a radius of 11 ft. With chalk line, join the intersection of these circles with the ends of base line and you will have the outline of a mainsail with an area of 45 square feet. The base is the boom, the right side the yard and the left the lea leach edge of the sail. With this outline as a pattern, lay out your sail of light unbleached muslin, running the stripe parallel with the leach and allowing for a turned over ¼-in. hem (½ in. of material) along the three edges of the sail, and for a 1-in. strapped seam to join the strips of muslin. Get 40-in. muslin and split each strip in two so that your sail will be made up of 20-in. widths. Pin strips together as you go along and have sail stitched and hemmed on a machine. Along the three sides of sail stitch 1-in. wide non-elastic webbing. Through this webbing, on the boom and yard edges set sheet brass washer grommets 1 ft. apart, making sure that a grommet is set in each corner of the sail, and that each grommet has a 3/16-in. eye.

The dandy or mizzen sail is to be of 23 sq. ft. area and measures 6 ft. 9 in. on boom, 7 ft. 8 in. on yard, and 7 ft. 10 in. on leach. If the 52 sq. ft. rig is desired, the following dimensions should be substituted:

	Mainsail	Dandy
Leach,	9 ft. 6 in	6 ft. 10 in.
Yard,	9 ft. 3 in	6 ft 6 in.
Boom,	8 ft. 3 in	5 ft 10½ in.

Booms and spars should be of straight-

grained pine, 1 in. in diameter at center, tapering to ¾ in. at ends, and 6 in. longer than the edge of sail to which they are to be laced. This will allow for stretching of sail and for minor errors in

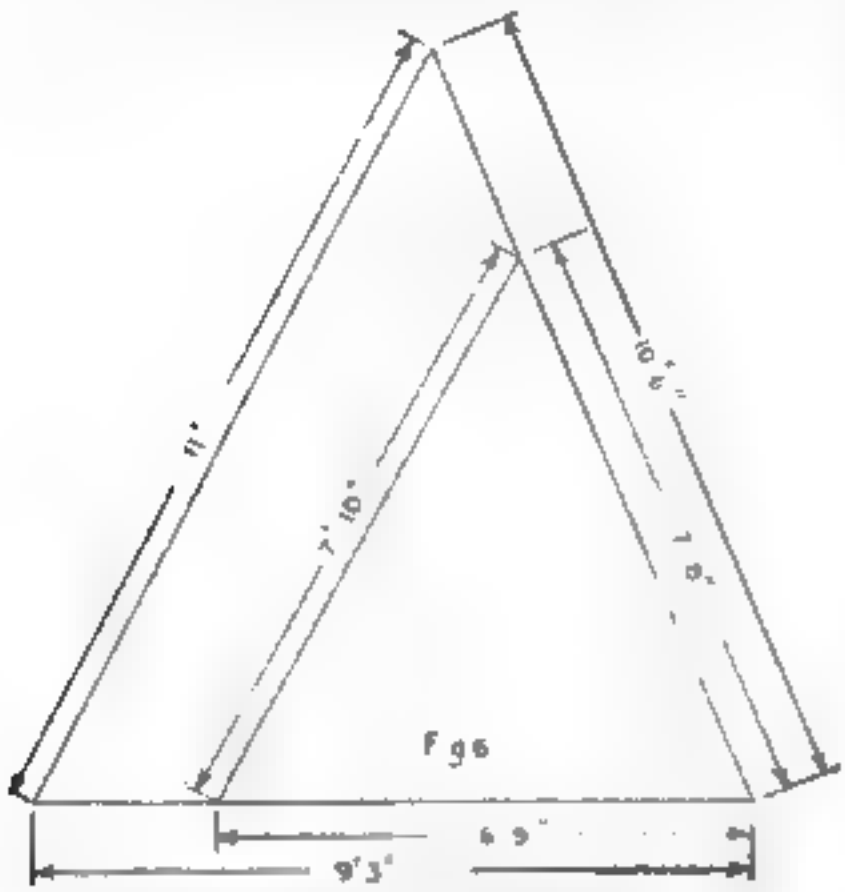
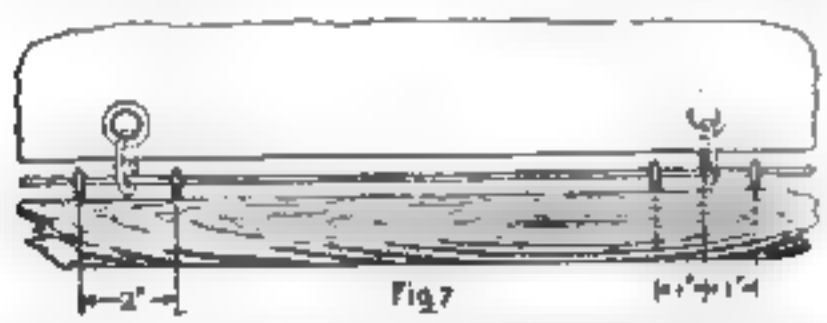


Diagram of mainsail and mizzen of a forty-five and twenty-three square-foot sail area

cutting and sewing sails to correct dimensions.

If you are a good enough mechanic to shape your spars from squared stuff, working down to an octagonal surface and then to a tapered round, very well, otherwise let a wood-working establishment shape them out from a dimensional sketch. As the masts will be short enough to be turned, they may be procured from a mill made to sketch at little more cost than the squared stock. Shape the spars first, and smooth and varnish them. Three thin coats of good spar



Method of lacing the seizing line through screw-eyes and grommet loops alternately

varnish, well dried and smoothed down between each coat, is better than one heavy coat. A wire nail driven into ends of spars will allow varnishing them clear up to the ends without finger marks and also serve to suspend them while drying.

Each yard is joined to its boom by a pair of heavy brass screw-eyes of from ¾ to 1 in. inside ring diameter, screwed into forward ends of booms and spars and connected by a heavy 1½-in. brass ring. Screw-eyes are opened to admit the rings and then closed upon them. Capping the ends of boom and spar with ¾ in. brass ferrules will obviate danger of splitting.

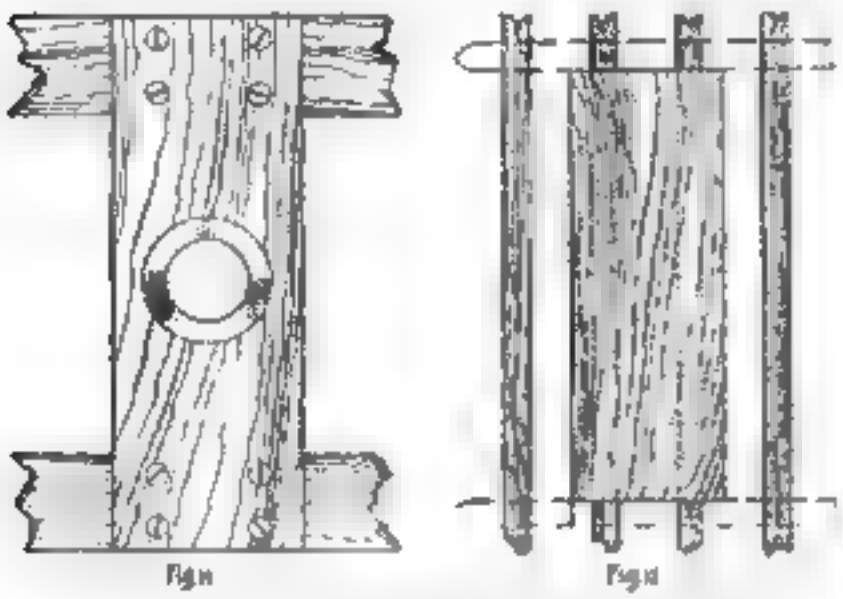
Lay one of the sails out on the floor and lay its yard and boom along its proper edges. Tie with seizing line the forward corner grommet to the connecting ring, and stretch the sails out along boom and yard, fastening them temporarily to their ends. With a soft pencil mark along boom and spar 1 in. each side of where each grommet (except corner and end grommet) comes. Set a line of brass screw-eyes, Fig. 7, (3/16 in. inside diameter) along booms and spar at these marks, being careful to keep them in line, and that eyes are at right angles to length of boom or spar. Tie a loop or ring of seizing line through grommet, excepting the corner end ones. Then lace a piece of seizing line alternately through these loops and the small brass screw-eyes.

The boom jaws, round mast plate and the flag pole plate are shown in the above sketch

Stretch the sail moderately taut, fasten the outer ends by their grommets to screw-eyes set out as far as possible on boom and yard, and then, fastening the lacing at one end to the forward small screw-eye, draw it taut and lash it to the rear one, leaving a foot of extra line for slacking up, which may be wound around boom or spar after the last knot is tied.

You may buy boom jaws or make them yourself. In the latter event, get a piece of ½-in. half-round brass, 22 in. long, and saw it in halves. Bend and hammer each piece into the shape and dimensions shown in Fig. 8, being careful to have flat surface inside the curve. At a point ¾ in. from end of the 3 in. arm drill and countersink for a 3/16 in. flat-headed machine screw. The same distance from the curve of gooseneck, drill and countersink for another. With two brass ma-

chine bolts, each 1½ in. long, fasten each jaw to its boom with the end of gooseneck pointing forward and its extreme end flush with boom end. Brass nuts and washers will keep the fastenings tight and



The brass floor plate fastened to ribs and floor grating construction to strengthen it

bolts should be sawed off flush with nut and filed smooth.

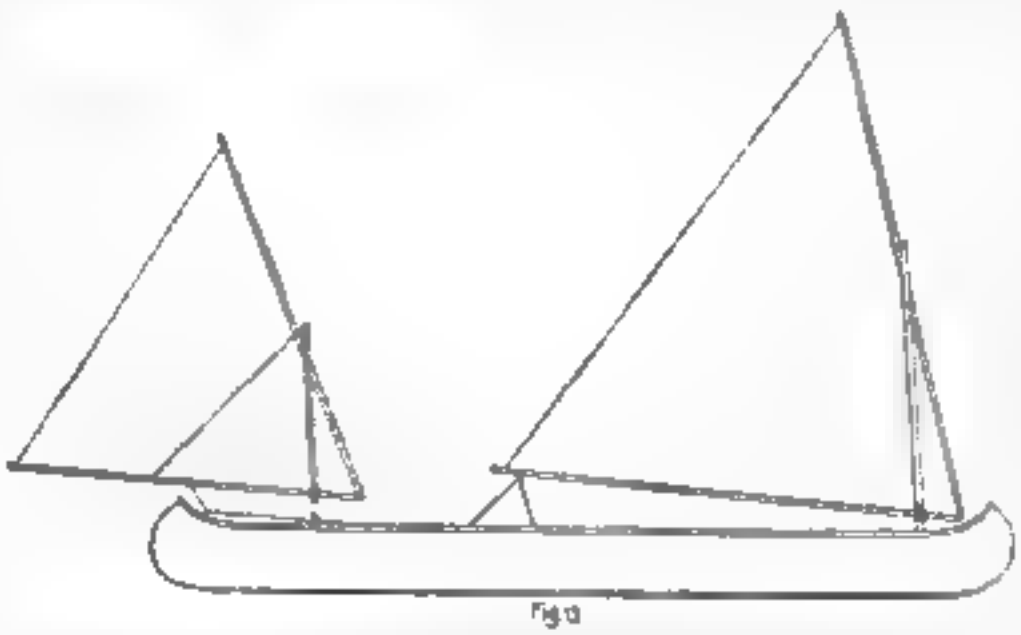
To properly step the masts you will require two 1¾ in. mast plates, Fig. 9, with four 3/16 in. machine screws ¾ in. long with brass nuts and washers to each mast plate, two flag pole plates, Fig. 10, with a 1¾ in. diameter hole. One of these will require three flat headed machine screws to fit screw holes in same, and of a length equal to combined thickness of forward deck, flag pole plate, and nut and washer. The other flag pole plate will require machine screws ¾ in. long with nuts and washers. Two pieces of ¼-in. brass will also be required whose dimensions will depend upon the construction of the canoe.

The after plate should be wide enough to extend ¾ in. beyond the flanges of the mast plate and long enough to extend from the after side of one rib to the forward side of the next. This will be found clearly illustrated in Fig. 11.

If the stem piece of the canoe terminates in a flat triangular board, the forward plate should be of the shape of this board; otherwise make it a duplicate of the after plate. After getting the plates shaped, file down edges and round corners, so that they will not cut your hands or mar luggage. Then bore the after plate as shown in diagram to take eight ¼ in. wood screws just long enough to go through ribs without penetrating the planking, and countersink on upper side. The location of screw holes for forward plate depends upon its size and shape.

Fasten one of the flag pole plates to upper side of after end of forward deck with center of hole coinciding with center line of canoe and set as far forward as possible without allowing mast to jam on after edge of deck. The nuts and washers of fastenings should be under the deck.

Get a piece of ½ in. oak, cherry or mahogany from 7 to 10 in. wide and as long as the width (front to back) of after seat. Lay second flag pole plate on one end of this plank with centre of hole coinciding with center of plank and with hinge line flush with edge of board. Mark position of screw holes of plate on plank and drill for the machine screws that fit plate, counter sinking on opposite side from plate for nuts and washers. This plank is to be screwed to under side of after seat frame with the mast plate on under side and with hole of flag hole plate in center of boat. Round-headed machine screws, with nuts and washers coming underneath the plank, are to be used as fastenings.



A sail plan for a sixty-eight-square foot rig with attachments placed on a seventeen-foot canoe

To hold plank in place while it and the seat frames are bored simultaneously, a pair of clamps or even monkey wrenches may be used. Stretch a line from center of stem post to center of stern post. Mark center line fore and aft on the ¼ in. brass plates. Lightly fasten these floor plates in their proper places with their center lines coinciding with that of canoe. Lay the mast plates on the floor plates, flange down, and through the flag

pole plates and into the mast plates, step a couple of curtain poles. Keeping the center of the mast plates on the center line of canoe, move them forward and backward until both masts have a pleasing and identical rake, when the position of the mast plates and their screw holes may be marked on the floor plates.

Fig. 14 Fig. 15

The shape of the blanche cleat and the clutch cleat for mizzen sheet both in brass

After drilling for these, countersink on the under side of floor plates. This permits the removal of mast plates without taking up floor plates as the nuts and washers will be on upper side.

The floor grating should be cut away as in Fig. 12 if it interferes with the installation of floor plates. Dotted lines under the floor plates indicate portions of two grating strips in way of floor plate. Broken lines along ends of plate show how these, when sawed away may be utilized as cross braces to keep the ends of shortened strips in place.

When all steps are permanently fastened, re-step the curtain poles. Near lower end of foreward one, and just high enough to keep from marring the deck, tie a brass pulley block with a ⅜-in. sheave. Tie another near the mast head so that you can hoist the mainsail as shown in Fig. 13. The governing conditions are that the forward end of boom must not foul forward deck and that the after end of boom must clear head of passenger seated beneath it. The mizzen should be at same height above floor at jaw as the mainsail, boom should have same lift and should clear after deck. Manipulate both sails until these conditions are met. Then mark on the yards the position of halliards and on the masts the positions of upper blocks, and mast plates. These dimensions give you data for your mast specifications. From butt of curtain poles to 6 in. above upper blocks will be length of mast. From floor to flag pole plates they should be cylindrical and 1¼ in. in diameter. From flag pole plates to mast head they must taper to 1½ in. diameter. Instead of upper block on mizzen mast, a sheave set in a mortise will be an improvement. Let sheave be 1⅛ in. diameter and ⅜ in. thick. Mortise to take this should be 2 in. long and ½ in. wide and its center one inch above place already marked for block.

When masts are finished, set the halliard blocks with brass screw-eyes which have been opened and closed over the eyes on blocks. Put around each mast, 1 in. above and below each jaw, a leather collar ¼ in. thick and 1 in. wide, attached with copper tacks. Soak in water to make pliable before attaching and shellac after they have dried. These collars prevent sails from hoisting too high or booms falling on decks when lowered. To keep mizzen out of the water when lowered, run an endless line through a screw-eye on masthead and through another one on boom as shown in Fig. 13. Use ½ in. clothes line for halliards and sheets and let main sheet run through a ring on boom and fasten with a snap to a ring lashed to center of thwart. When close hauled, this gives a double purchase and when cast off in running ahead of wind doubles the length of sheet. The mizzen sheet passes through a screw-eye on after deck, as shown in Fig. 13, to a clutch cleat, Fig. 14, placed within reach of the skipper's left hand. To belay halliards, two blanche cleats, Fig. 15, are attached to right hand in-wale within reach of the right hand. That for the mainsail has the hook set aft, and that for the mizzen has the hook forward.

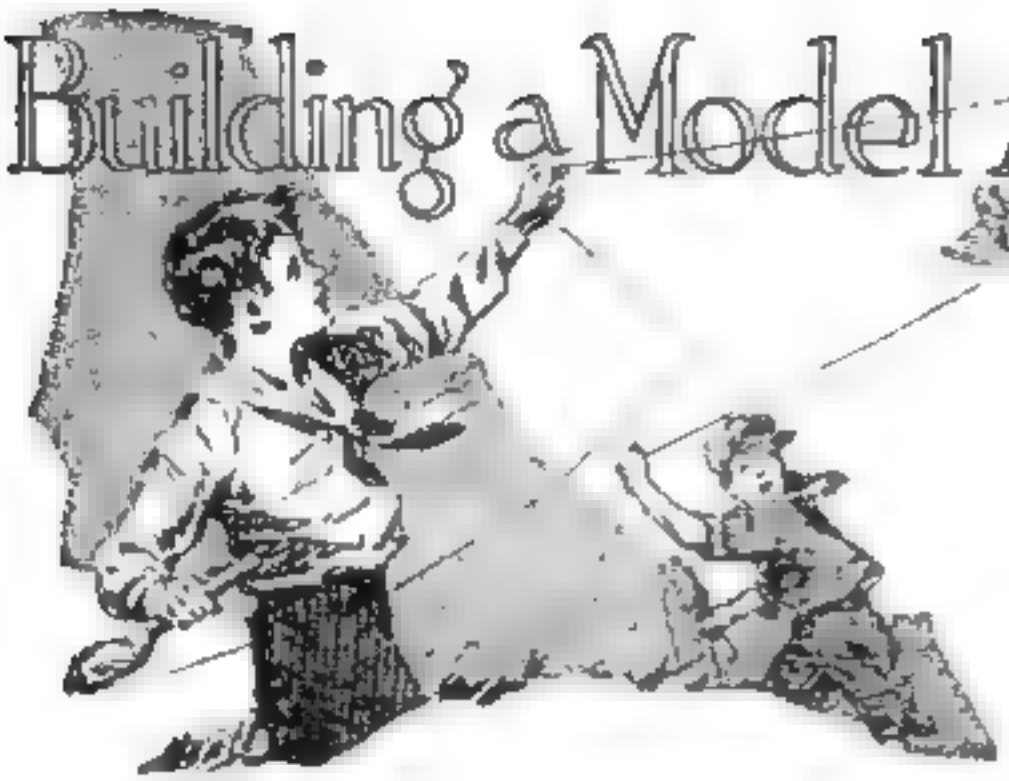
(To be continued)

Freezing a Glass Tumbler to a Block of Wood

SELECT a small, planed block of hard wood and place upon it a few drops of water and then a glass tumbler having a smooth bottom. Pour about 1 in. of water into the tumbler and add powdered ammonium nitrate, stirring the mixture constantly. As the ammonium nitrate goes into solution, it absorbs heat, producing a low temperature which quickly freezes the tumbler fast to the block, so that the latter will not fall when the tumbler is lifted from the table. Frost also gathers on the outside of the tumbler.

Building a Model Airplane Kite

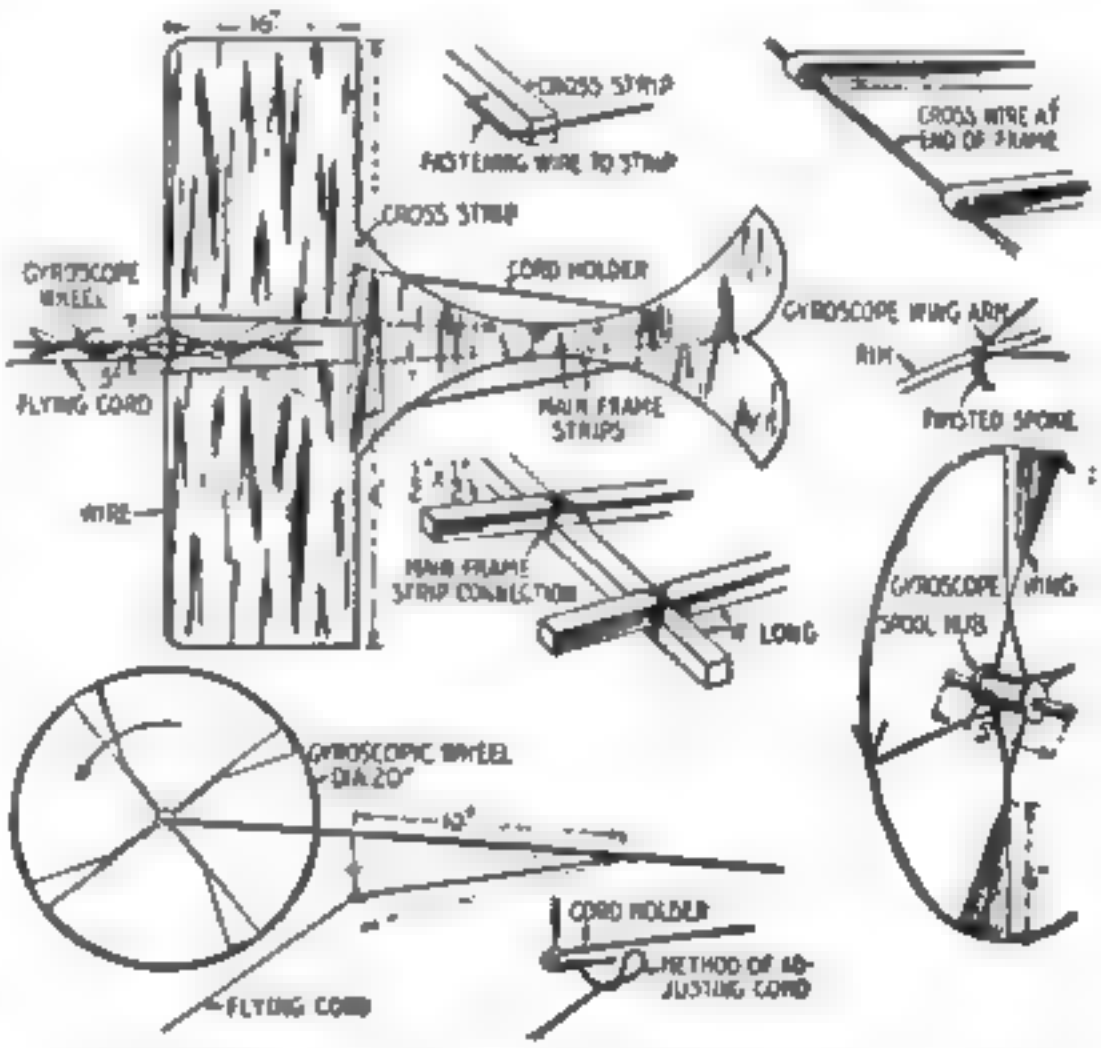
By J.S. Zerbe



KITES and airplanes are associated in the mind of the present-day boy. The former came down to us from great antiquity; but the flying machine, as we know it, is of such recent origin that the wonder due to its performances has not yet abated. It is singular that the one great weakness in airplanes is lack of control—the inability to stabilize the floating device. That has always been the difficulty with kites. The box-kite is not an old invention. That and the Malay kite have no tails, but possess inherent stability. The development of the airplane has brought out a stabilizer—the well-known gyroscope, which, when set in motion, objects to a change in the plane of its rotation. This device is now applied to a kite in such a manner as to give it a steady motion and to add wonderfully to its attractiveness when in flight.

The outline of the kite approaches the ordinary airplane structure. The gyroscopic wheel is at the forward end of the main plane, mounted on a horizontal axis, so that it rotates on a vertical fore and aft plane, giving an air of vitality to the kite, and making it appear as though the wheel actually propels or sustains the kite in its flight through the air.

The frame is made of a pair of pine strips, each 4 ft. long, of straight clear pine, ½ by ½ in. in thickness. These are secured together at their rear ends and separated 5 in. from each other at their forward ends. They are held in permanent alinement by a cross strip, also 4 ft. long, of the same material and dimensions, this strip being located 16 in. from the forward ends of the parallel strips. At the crossing points the pieces



A wheel is interposed between the front ends of the main frame; the wind gives it speed for gyroscopic action

are provided with shallow gains, so they will fit together snugly, and are then secured by means of small wire nails and wrapped with a strong fine cord.

A thin, stiff, steel wire, not exceeding No. 20 gage, 6 ft. in length, is threaded through holes in the forward ends of the main parallel strips, and bent back at their outer ends so they meet the extremities of the cross strip. The detailed section of the drawing shows how the wire and strip are secured together by the two right-angled bends, the end limb of the wire resting in a groove and the short bent part of the wire adapted to enter a hole, after which the two parts are wrapped with a thin cord.

The fish-tail has at its margins a wire, properly bent and attached to the parallel strips and cross strip, thereby forming the entire frame ready to receive the covering. This may be of silk, glazed cotton, or paper, preferably waterproofed. This should be applied on both sidee, or silk on the lower side and water-proof paper on the upper side, thereby making a neat and durable job. Every part of the framework is covered except that portion between the parallel bars forward of the cross strip.

Before the wire at the front part of the frame is placed into position, the gyroscope wheel must be put on the wire. The wheel is made as follows: A ring of heavy wire (No. 12 gage will answer) is bent into form, and held at the abutting ends by a tin tube. This ring should be not less than 20 in. in diameter, the object being to make the wheel with considerable weight at the perimeter, to give a proper gyroscopic effect.

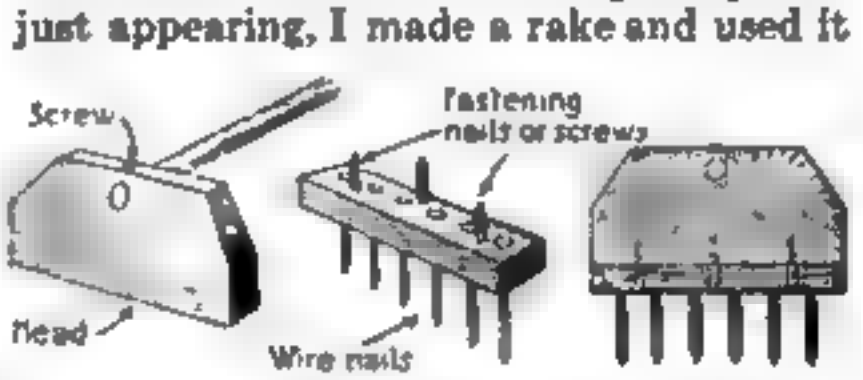
A common spool is used for the hub. This should have a wooden tube through the axial bore, provided with a hole large enough to permit the spool to rotate freely on the wire. A pair of cross holes is bored through each end of the spool to receive wires. On each of the four sides these wires are brought together in pairs, and twisted to form spokes, the outer ends of these twisted spokes being wrapped around the ring and their ends permitted to project out a distance of 8 in. and so disposed that they form V-shaped arms. Triangularly-formed pieces of fabric or paper are then attached to these arms, and folded around the twisted portions of the spokes, to form open V-shaped grooves.

When the wheel is in position, the open parts of the grooves or wings thus provided, are so disposed that the wind will drive the wheel in the direction that the kite moves, the upper part of the wheel moving forward. This action of the wheel not only steadies the kite but has a greater or less tendency to draw down the forward end of the kite, which permits of the flying cord being placed behind the wheel.

The flying cord is attached to the cross strip behind the wheel, two points of attachment being necessary, about 10 in. apart. This cord is merely a loop, which hangs down 1 ft. or more. To this loop the main cord is fixed. As it is necessary to provide a means for adjusting the cord so that the proper angle may be given to the kite, a pair of wire arms, each 20 in. long, are secured at their rear ends to the tail of the kite, the forward ends terminating at a point below the rear cross strip of the kite. Each wire arm has a hook, or return bend, so that the looped cord may be wrapped around and secured to the hook at such a point as to give a greater or less distance between the cross strip and the hook, to enable the flyer to give a greater or less angle to the kite. The nearer the hook is to the body of the kite the flatter will be its angle in flight, and by this provision the kite is adapted to be adjusted for a wind of any velocity.

A Fine-Toothed Rake With Detachable Tooth-Holder

FINDING the ordinary garden rake too coarse to use among the plants just appearing, I made a rake and used it

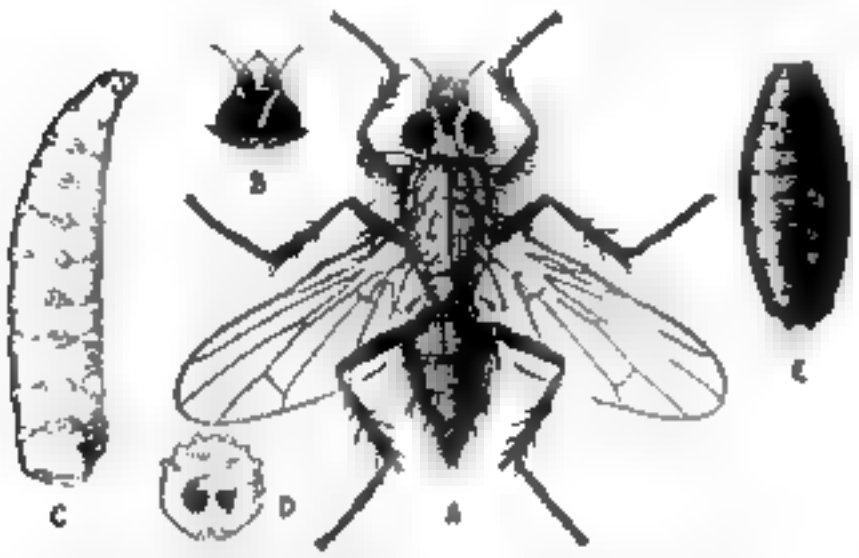


The construction of a garden rake head in which nails are used for the teeth

where I could not handle a larger rake. The illustration clearly shows the whole construction. Wire nails placed as far apart as suitable. The tooth-holding section should have the tooth-holes bored out to prevent splitting when the teeth are driven in. By having tooth-holders equipped with teeth of different sizes and set at various distances apart a combination rake is obtained.—JAMES M. KANE.

Cabbage Root Maggots and How to Control Them

CABBAGE and related crops frequently suffer severe injury from the cabbage maggot. Young plants are most seriously affected, the maggots eroding the outer surface and boring into the interior



The cabbage maggot. A, female fly; B, head of male; C, maggot; D, anal end; E, puparium

of the roots, devouring the tender rootlets and frequently penetrating the lower portion of the stalk.

This insect, also known as the radish maggot, is an imported pest, and it does very serious injury throughout the Northern States and Canada, attacking all forms of crucifers, whether wild or cultivated. In the above-mentioned region it is the cause of more or less loss to the crops year after year, but, as with other destructive insects, it is much more abundant in some seasons than in others.

Since this species also is a root feeder, the remedies prescribed by the U. S. States Department of Agriculture for the seed corn maggot are applicable. In addition there are certain preventive and other measures for its destruction that have been found successful, their use being justified by the value of the plants.

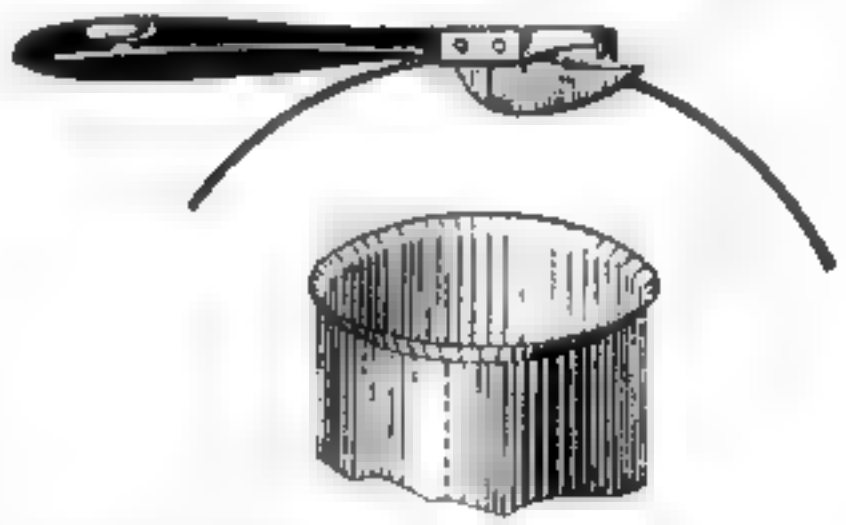
To be thoroughly effective these methods should be employed before the insect's eggs are laid. A common method for deterring the parent flies from depositing their eggs consists in placing sand soaked in kerosene—a cupful to a bucket of dry sand—at the base of the plants, along the rows. This mixture will also kill young maggots that might attempt to work through it.

When the maggot attacks radish, or other plants than the cabbage and the cauliflower, prepare a solution as follows and apply around the stalk of the plants affected. Add to 1 lb. of soap boiled in 1 gal. of water, ½ gal. of crude carbolic acid and dilute the whole with 35 parts of water. It is best to use this mixture a day or two after the plants are up or transplanted, and repeat every week or ten days until about the third week in May, after which there is less danger.

Although laborious, hand picking has the merit of being effective, and is practiced with considerable success by extensive cabbage growers, but it is not practicable with radish and similar crops. It consists in pulling up the young plants, examining the roots for eggs and maggots and crushing with the hand or by washing the roots in a strong solution of soap and then replanting. By looking closely, the minute white eggs may be seen about the stalks of the young cabbages, and if the earth is raked away so as to expose the eggs to the sun they will dry up, thus preventing the maggots from hatching. Afterwards the plants should be hilled. In most cases the plants will show no evil effects from this treatment after two or three weeks have elapsed.

Cutting a Heater Pipe with a Can Opener

WHILE replacing some hot air heater pipe a householder found it necessary to cut off part of a section. Lacking



Method of applying a can opener to the metal for cutting around a heater pipe

a pair of tinner's shears, he used an ordinary can-opener in the manner shown. The starting cut was made with a chisel. The can opener, while cutting, also produced a nice, uniform flare, very convenient for the insertion of the end of another section.—JAMES M. KANE.

The Color of Gasoline Does Not Denote Its Quality

AT one time the refineries turned out yellow kerosene and gasoline and the methods used made the liquid somewhat dangerous. For this reason, the public demanded a pure white gasoline. But the new cracking process produces a perfectly safe gasoline which has a slight yellowish tinge.

Converting a Porch Swing Into a Baby's Bed

A PORCH swing can be easily converted into a cool, as well as a safe bed for the baby by attaching a swinging apron to the edge of the seat. The apron

A frame covered with wire screen to raise over the seat opening for making a baby's bed

consists of a frame made the same size as the opening between the two arms of the swing and covered with wire screen. The frame is hinged to the front edge of the seat so that it can be swung up and fastened with hooks and eyes to the outside of the arm. Another hook can be attached to the under side of the seat and an eye fastened into the frame so that it may be used to keep the frame from striking the legs of the occupant when the bed is re-converted into a swing.—J. A. FITZPATRICK.

Making a Lawn Leveling Tamper of Wood

TO make a handy tamper for leveling lawns, paths, etc., first procure a 12-ft. piece of 2 by 4-in. scantling, and a section of planking about 10 by 12 in. in size. From the scantling cut four pieces each about 10 in. long, four pieces about 12 in. long and one piece about 4 ft. long. This last piece should have one end whittled down into a rounded handle.

Tamper made of wood pieces

The method of constructing the tamper can be best understood by referring to the drawing, which shows the eight short pieces of scantling nailed together in the form of a "crib" with the 4-ft. piece in the center as a handle and the section of planking nailed to the bottom to make a smooth surface. Obviously scraps and odd pieces of scantling of the proper size can be used in place of the 12-ft. piece. Also the number of short pieces can be varied to obtain the weight that is desired.—FRANK L. MATTES.

Removing Yellow Stains from Piano Keys

PIANO keys, by use, will turn yellow. To restore the original whiteness, put 1 oz. of nitric acid in 12 oz. of soft water (pour the acid slowly into the water—do not reverse this or the acid will fly up into your eyes) and apply the liquid to the ivory with a brush, taking care that no acid gets on the woodwork. Wash off the acid with a piece of flannel dipped in clean water and wipe with a dry cloth. Besides restoring piano keys, this same mixture is equally efficacious for cleaning the handles of cutlery and other similar articles.

Simple Designs for Sheet Metal Working

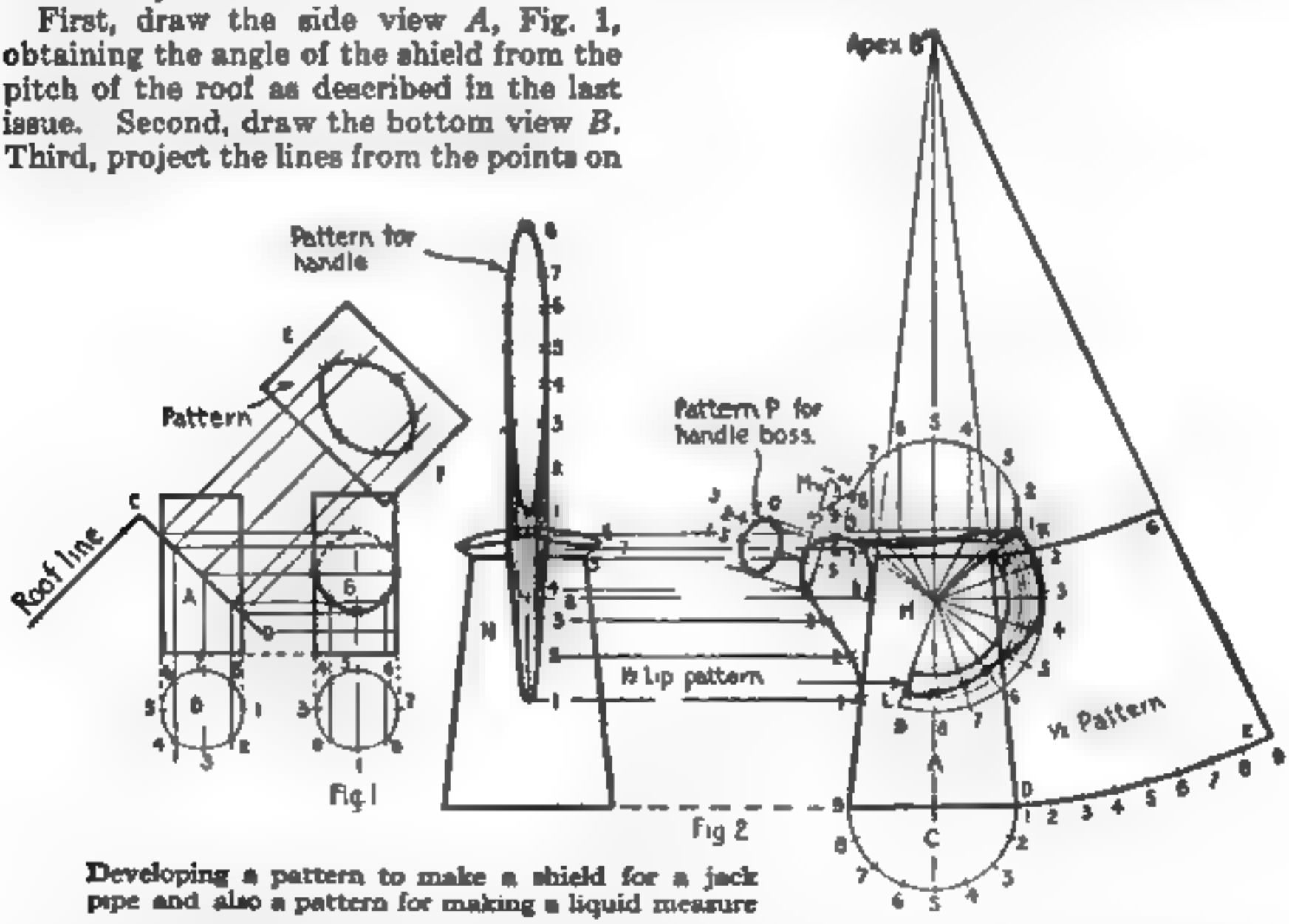
XII.—Interesting pattern problems developed by means of radial lines

By Arthur F. Payne

Director of Vocational Education, Johnstown, Pa.

IN the last issue, one of the problems developed was the pattern for the hole in the shield of a hopper. The illustration Fig. 1 shows the method of developing the shield for a "jack pipe" or bath room ventilator pipe coming through a roof, (in the illustration the roof is drawn very small). The method used is exactly the same as for the hopper, but as the hopper was developed by radial lines and this jack pipe is developed by use of parallel lines, it will make it much easier and make a good review of the method if we briefly outline the steps of the development.

First, draw the side view *A*, Fig. 1, obtaining the angle of the shield from the pitch of the roof as described in the last issue. Second, draw the bottom view *B*. Third, project the lines from the points on the bottom view circle upward until they meet the shield line *C-D*. Fourth, project lines out exactly at right angles to the shield line *C-D*. Draw the center line *E-F* Now it will easily be seen that these lines give us the length of the hole, also that if we can get the correct widths on these lines we shall have the pattern of the hole. To get these correct widths we must draw the front view *G*, which is done as follows: Fifth, draw the pipe and the bottom view being careful to note that the numbers are turned a quarter turn to the left, number one being in front instead of on the right side. Sixth, project the lines up from the bottom view until they cross the same numbered lines coming over from the side view. Mark these points with a cross. Connect these crosses with a curve and we will have a correct view of the front view of the joint of the pipe and the shield. The upper part of the joint is drawn in dotted lines because it is back of the pipe and cannot be seen. Seventh, with a pair of compasses measure the



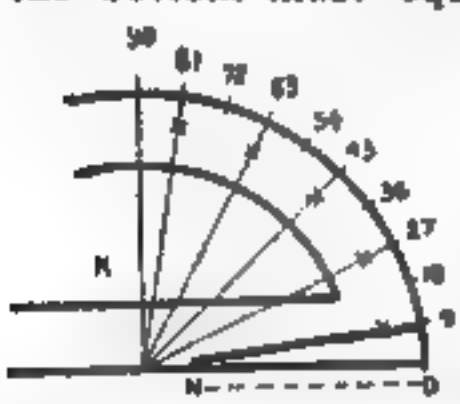
Developing a pattern to make a shield for a jack pipe and also a pattern for making a liquid measure

different widths and place them on the same numbered lines on the pattern. Mark with a cross and then connect these crosses with a curve and you will have the pattern for the hole.

The next problem, Fig. 2, that of the measure, gives us four patterns to develop, all of which are very interesting. The drawing appears somewhat complicated on account of overlapping lines, but if you will follow the directions carefully you will have no difficulty.

Government Proportions for Graduating Liquid Measures

Before we develop the patterns it might be well to know the U. S. Government proportions for liquid measures. No matter what the size of the measure, the diameter of the bottom must equal two-thirds of the vertical height, the diameter of the top must equal two-thirds of the diameter of the bottom.



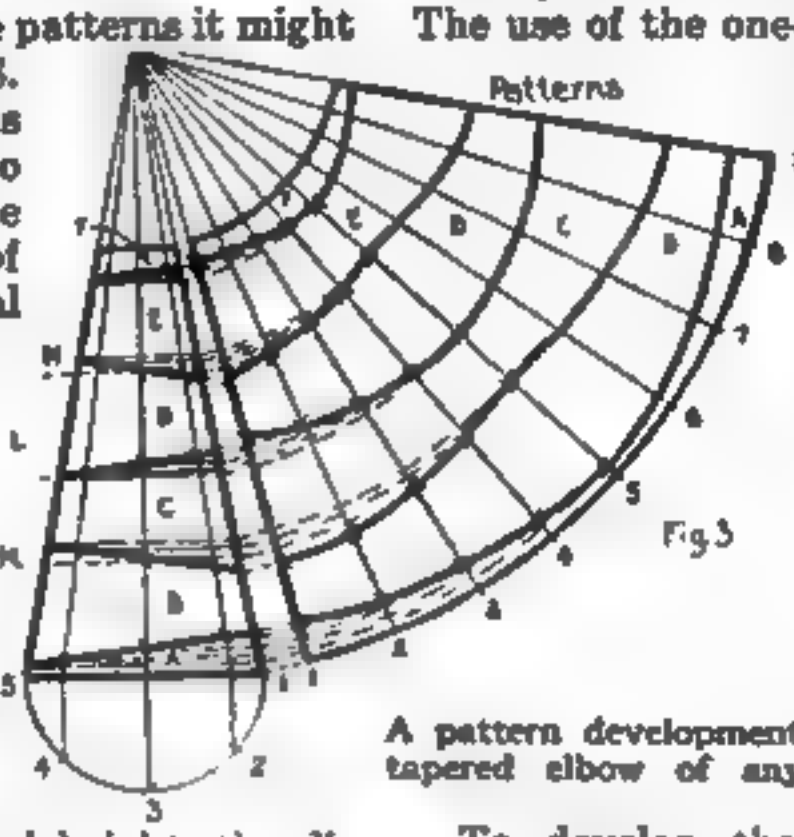


Fig. 3

LIQUID MEASURES

Sizes in inches

Size	Height	Diameter Base	Diameter Top
1 gallon	9.80	6.53	4.35
½ "	7 78	5.18	3.45
1 quart	6.17	4.11	2 74
1 pint	4 90	3.27	2.18
½ pint	3.89	2.59	1 73
1 gill	3.09	2.06	1.37

FLARING PAILS

Size	Height	Diameter Base	Diameter Top
2 quarts	4 inches	4½ inches	6¼ inches
1 gallon	5½ "	5 "	6½ "
6 quarts	6¾ "	5½ "	9¼ "
2 gallon	7½ "	6 "	10½ "
10 quarts	8 "	7 "	11½ "
14 quarts	9 "	8 "	13 "

No matter what the size the method of developing the patterns is exactly the same The method used in Fig. 2 is as follows: To develop the pattern for the body of the measure. First, draw the front view *A*, the correct size and proportion, continue the side lines up to the apex *B* and draw the one-half bottom view *C*. Second, with the dividers strike the pattern arc *D-E* getting the correct length by stepping the eight spaces of the bottom view. Third, strike the arc *F-G* and the one-half pattern will be complete.

This series has been running long enough now for those of you who have worked out all the problems to be ready to adopt "short cuts" and quick methods. The use of the one-half bottom view and the development of the one-half pattern are simple "short cuts," others will be demonstrated later.

A pattern development for a ninety-degree tapered elbow of any number of pieces

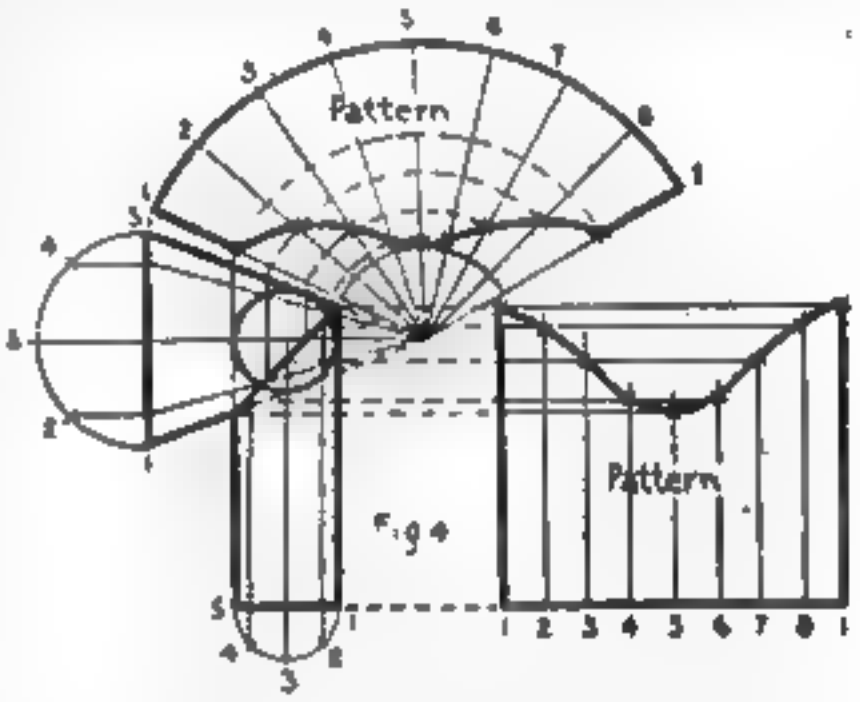
To develop the pattern for the lip which is merely part of a cone, the apex of which is at *H:* First, draw the outline of the lip, then draw the complete cone of which it is a part by continuing the side lines. Second, draw the one-half bottom view *J*. Divide it into eight equal spaces. Project these points to the base line, then to the apex *H*, where these lines cross the outline of the lip. Draw lines straight over to the side line to get the true lengths as you have done before on previous problems. Third, draw the pattern arc *K-L*, getting the correct length by laying off the eight spaces from the bottom view. Draw lines from these points to the apex *H*. Now swing the lines over from the side line until they cross the same numbered line coming up from the arc *K-L*. Make a cross where the lines cross, connect with a curve, draw the arc for the lip to join on to the body and the one-half pattern for the lip is complete.

The "boss" on the inside of the handle is part of a cylinder so it must be developed by parallel lines just as we developed the elbows and tees in previous issues. In this pattern we use the same principles as in Fig. 1. First, from the front view project lines upward and draw the section view *M*, obtaining the width from the other view of the handle marked *N*. Second, divide the section circle of the boss into four parts. Project points 2 and 4 down to the front view of the boss. From where these lines cross the handle, draw lines at right angles. Draw the line *O-P*. Now we have the true length of the pattern. We can get the true widths from the sections view, measuring off four of the section spaces on line 1-5 on the pattern and two on line 2-4 of the pattern, do the same with the lower half, connect these points with a curved line and the pattern for the handle boss is complete.

The pattern for the handle is a new application of some previously demonstrated principles in parallel lines. First draw the view *N*. Second, divide the outline of the handle into any number of spaces as shown by the crosses. Project these points across to view *N*. Number them as shown. Third, draw the center line of the pattern, get the correct length by measuring with compasses the spaces on the outline of the handle and transferring them to the center line of the pattern. Be sure to give each point the same number on the pattern as it has on the other views. Fourth, project lines up to the pattern from the points on the *N* view of the handle. Make crosses where these lines cross the same numbered line on the pattern. Join the crosses with a free hand curve and the pattern for the handle will be complete.

A simple problem that is often confusing to the ordinary sheet metal worker is illustrated by Fig. 3. The problem is that of developing the patterns for a ninety-degree tapered elbow of any number of pieces. This elbow has six pieces and the small diameter is one-third that of the large diameter. These patterns may also be used for a ship's ventilator, although this type of ventilator should not be confused with the regular oval ventilator which is developed by "triangulation." This method will be explained later in the series.

Each section of the tapered elbow is part of a cone as can be seen in drawing *L*. To develop the patterns: First, draw a cone, the base of which is equal to the diameter of the large end of the elbow. Second, on the upper part of the cone draw the line for the small diameter of the elbow. The altitude of the cone may be varied to suit the length of elbow required. Third, we must now obtain the miter lines. This is done in exactly the same manner as explained in the October 1917 issue for ninety degree cylindrical elbows. The rule given there is: "In all elbows of more than two pieces, the two end sections should be one-half the size of the other sections." In this case



A pattern for another type of a ninety-degree reducer elbow used for a ventilator

there are six sections to the elbow so the four middle sections will each have twice the number of angles in it as the end section. This is shown in drawing *K* which illustrates the use of a "protractor" which is a small brass "angle measure" and can be bought for 25 cents. The crosses indicate the miter lines. Note that the two end sections have only 9 deg. each, while the middle sections have 18 deg. each. Take the diameter of the cone base and lay it off as *N-O* on the drawing *K*. This will give the exact shape of section *A* on the cone. Lay this off as section *A* on the cone. Take the distance on the center line of section *A* and set off the same distance on the center line for section *F*, then divide the remainder of the center line into four equal spaces. Draw the miter lines at an angle of 9 deg. to the line *M* which is

drawn at right angles to the center line, starting at the four equal division points. Develop the pattern for these sections in the usual manner, using "radial lines" as described before. Briefly the steps are: Draw the one-half bottom view, divide into four equal parts, project lines from these points to base lines then to apex, strike arc for pattern, get correct length by stepping off eight spaces from bottom view, from where the lines from the base to the apex cross the miter lines, draw lines at right angles over to side of cone to get the true lengths, swing these points over to the pattern until they cross the same numbered lines on the pattern, make a cross where these lines cross, connect crosses with free hand curves, and pattern will be complete. The drawing *H* shows the proportions of the finished elbow.

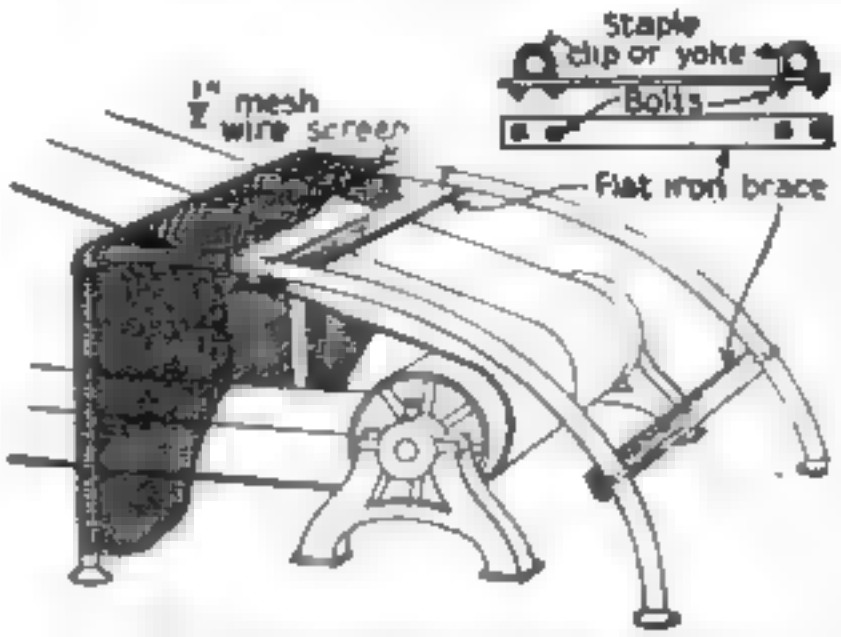
The illustration Fig. 4 shows another 90-deg. reducer elbow, which is often used for a ventilator. The details of this development will not be given as they have already been explained many times in this series. The reason for giving this problem was to illustrate a new and interesting method. When drawing this reducer, great care must be taken to have the joint at 45 deg. to the center line of the pipe and of the cone. To do this, draw a circle equal to the diameter of the pipe and then draw the cone so that both its outside lines are tangent to the circle as shown in the drawing. This will bring the outside lines of both cone and pipe just touching the circle, as shown in the drawing. The pattern for the pipe is developed by means of parallel lines, the pattern for the cone by means of radial lines.

Do Not Use Fuel Savers. Regulate Your Dampers Instead

AN old fireman says, "Not one person in ten operates the draughts of his furnace properly or handles his coal to good advantage." It will be found that the coal savers, of which there are many, are accompanied with a set of rules, which, if observed, without using the saver, would go a long way toward conserving fuel. Do not spend money on these chemical compounds. The most sensible practice is to sprinkle the coal with water before throwing it upon the fire.

Bracing for Belt Guard to Cover Floor Countershaft

A BELT guard frame to cover a floor countershaft was built of pipe and fittings, with wire cloth stretched over them. This caused the two parts to be



A guard frame of pipe and fittings placed over a countershaft attached to the floor

pulled together at the top. The braces to hold the upper parts at the right distance from one another were made of flat iron, 1¾ in. wide and ⅜ in. thick with U-bolts to clamp around the pipes.

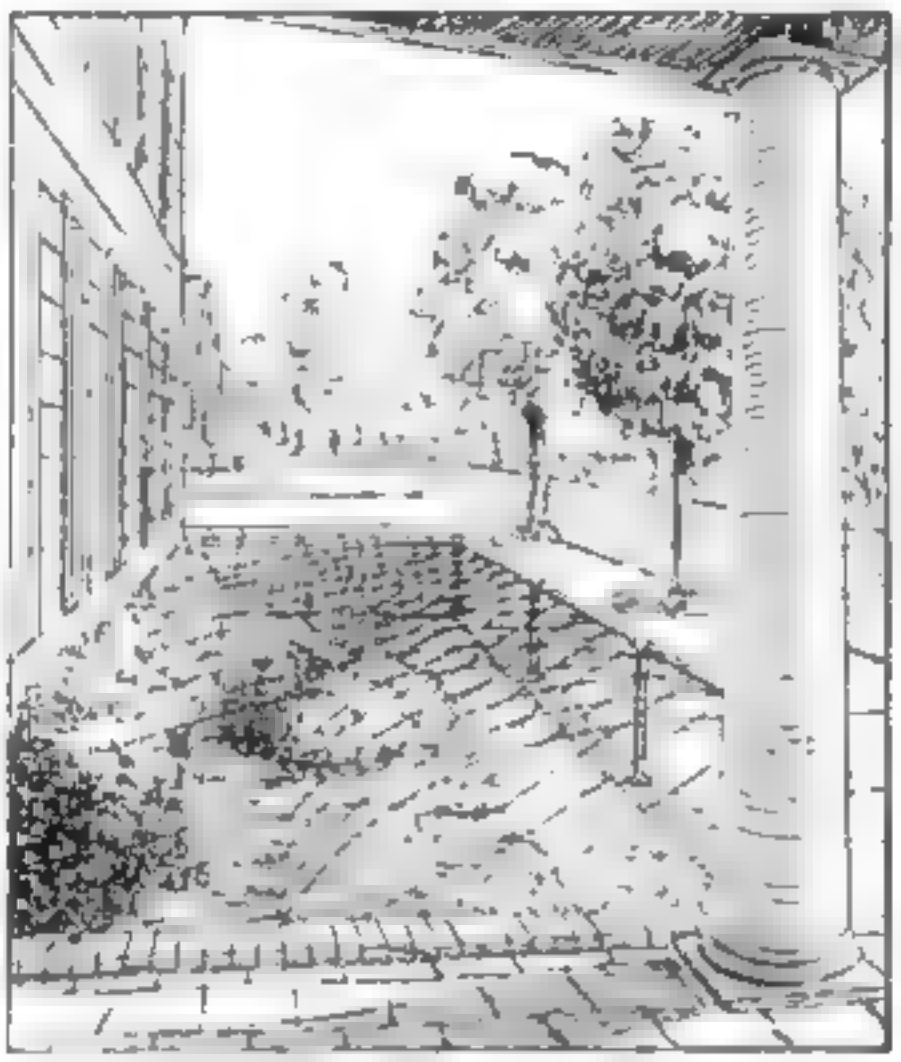
This method of guarding belts is excellent as it affords a clear view of the machines, while the flanges permit the whole frame to be unbolted and unscreened quickly when necessary.—JAMES M. KANE.

Carrots Used as a Subatitute for Eggs in Puddings

IN these days of high prices, anything that can be used as a substitute, and give good results at the same time, will be a welcome addition in helping to keep down the high cost of living. Boiled carrots, when properly treated, form an excellent substitute for eggs in puddings, etc. Boil the carrots until they are tender and nearly ready to fall apart; drain carefully, and mash and press through a coarse cloth or strainer. The pulp is then introduced among the other ingredients of the pudding and the eggs totally omitted. Puddings made in this manner are lighter than where eggs are used, and are more palatable. The carrots also impart a fine yellow color to the pudding so that nobody can tell whether eggs were used or not.

Here Is a Combination Fence and Lawn Sprinkler

IRON pipe ¾ in. in diameter is extensively used for protecting the small grass spots between the sidewalk and the street curb, also between the sidewalk and the building, providing the space is not large. These plots are very difficult to keep watered in dry seasons. One resident owner made a combination fence, using the pipe for the sprinkling apparatus as well as for the guard. Small holes were drilled in a row on the inside surface of the pipe and the whole line was connected with the water supply. In building such a protection be sure to have all joints watertight and the tees plugged that are used to connect the iron supports for the posts.—THOMAS W. BENSON.



The pipe guarding the grass plot is used for sprinkling the ground in a dry season

Changing Ink Into Water. This Is Black Magic

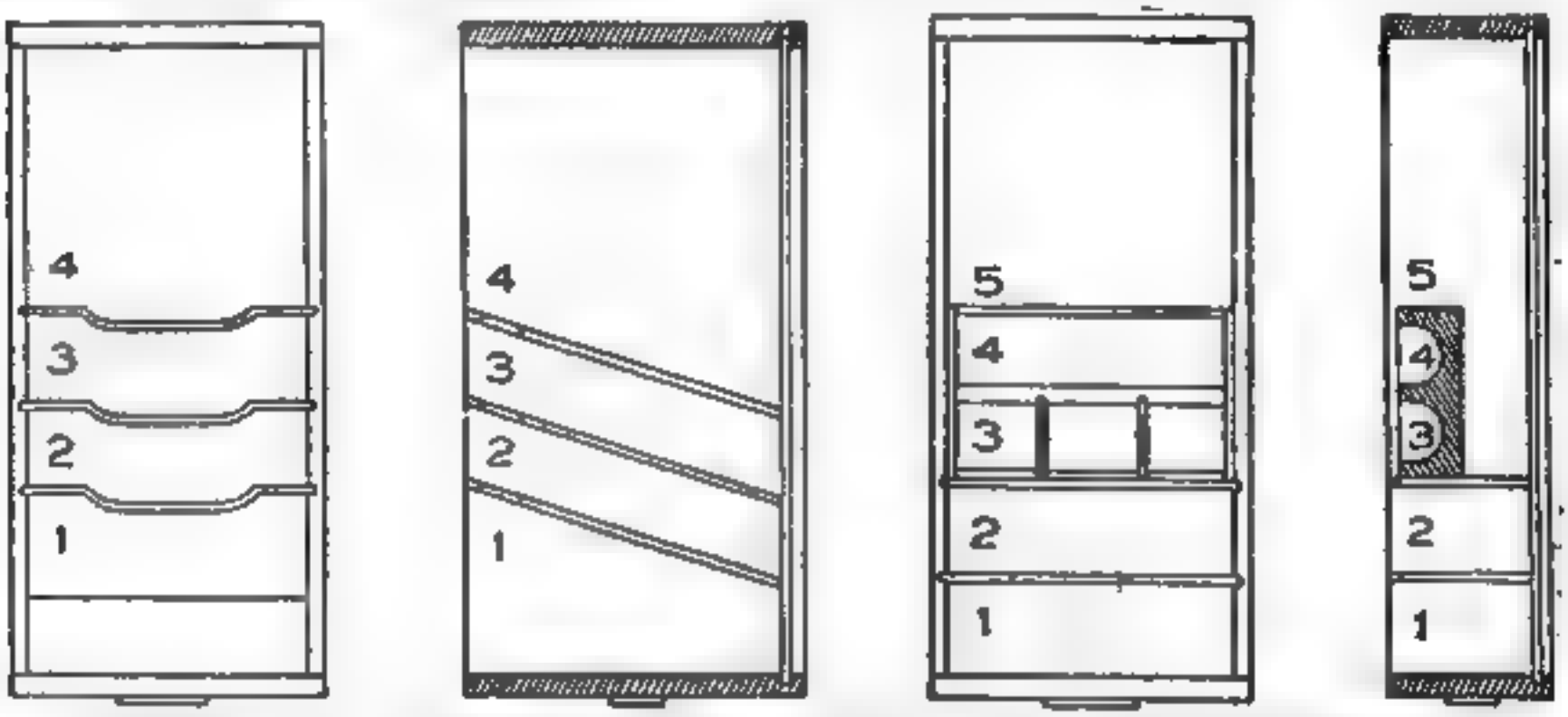
THE performer introduces to the audience a glass or bowl of ink which is covered over for an instant by a lady's handkerchief, during which time it becomes changed to clear water. This trick can be performed with any sized glass from a miniature tumbler up to a large fish globe. The fish globe will be described here, as it differs but little from the smaller sized glasses.

There is made to fit inside of the globe a lining of alpaca, or black silk without any bottom, and around the top of which runs a wire over which the alpaca is turned to prevent it from falling down. The lining is made to fit the glass as closely as possible. When the water is poured in and presses the cloth out against the glass, the globe appears to be full of ink.

This is exhibited to the audience, and to prove the genuineness of the fluid, the performer takes a ladle and dipping it into the bowl, pours out some of the ink into a plate, which is sent around. The ladle is made with a hollow handle which has a small hole at the bottom, leading into the bowl of the ladle. Another small puncture is made within 1 in. of the top of the handle. Before commencing the trick, ink is poured into the ladle bowl, which, when the ladle is tilted, runs up into the handle, but is prevented from flowing back again by a finger or thumb placed over and covering the top hole. The ladle can, therefore, be held in any position without fear of the hidden liquid coming out. When it is dipped in the globe it is not allowed to enter the water, but is only lowered to the surface, the finger at the same time being removed from the hole in the handle, allowing the ink to flow down and into the bowl of the ladle, from which it is then poured into a plate and handed out for examination. The former next borrows a large handkerchief with which to cover the bowl and touching the glass with his wand commands the ink to vanish. When the covering is lifted the bowl will be found full of clear water, with gold fish swimming in it. In snatching off the handkerchief the wire ring is grasped and whipped off under cover and dropped into an open drawer at the rear of the table. This trick is extremely effective when adroitly done, as the transition seems so obvious because of the sample handed around in the ladle. The magician should not forget to "patter" while doing the trick.

Arrangement of a Stenographer's Desk for Accessibility

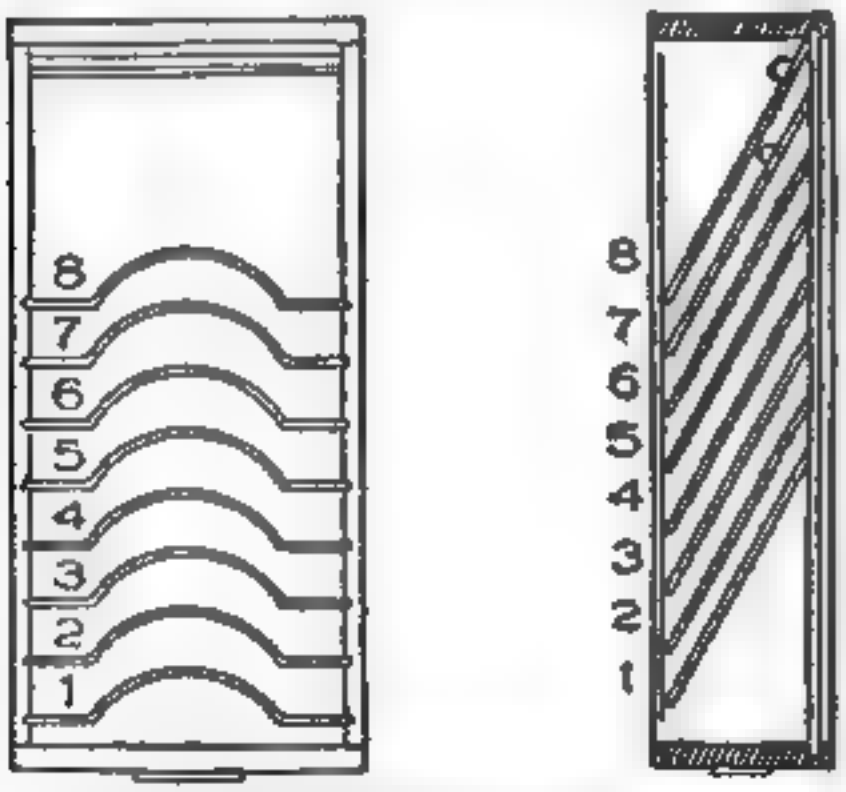
AFTER receiving a large number of suggestions from various customers a typewriter firm has worked out an efficient and handy arrangement for a typewriter desk in which all of the various letter and bill heads as well as other supplies may be kept within reach of the stenographer. All of the drawers are intended to be open when the stenographer is at work, the general movement being from right to left.



The arrangement of the upper right and lower left drawer to the desk for keeping the various kinds of paper used in correspondence, envelopes, pins, clips and the pencils

The upper right drawer has compartments which are used as follows: sheets for carbon copies, 1; thin white paper for additional copies, 2; inter-office letter heads, 3; general correspondence letter heads, 4; heavy white paper for long memorandas and second sheets, 5; folder of carbon paper, 6; special letter heads, 7; and telegram blanks, 8.

The lower right drawer consists of compartments 1 for No. 6 and 10 envelopes; 2 for inter-department messenger slips, inclosure slips and a pyramid of pins; 3 is for erasers, clips and rubber bands; 4 is for well-sharpened pencils and 5 for No. 6 and 9 envelopes and note books. The left drawer has compartments, 1, finish work; 2, letters to be answered and other papers being used in connection with work; 3, carbon copies, and 4, miscellaneous supplies and forms, personal belongings, cleaning outfit and dust cloth.



The left drawer has compartments for finished work, letters to be answered and other papers

Do You Want Your Tires to Last? Then Fill Up the Cuts

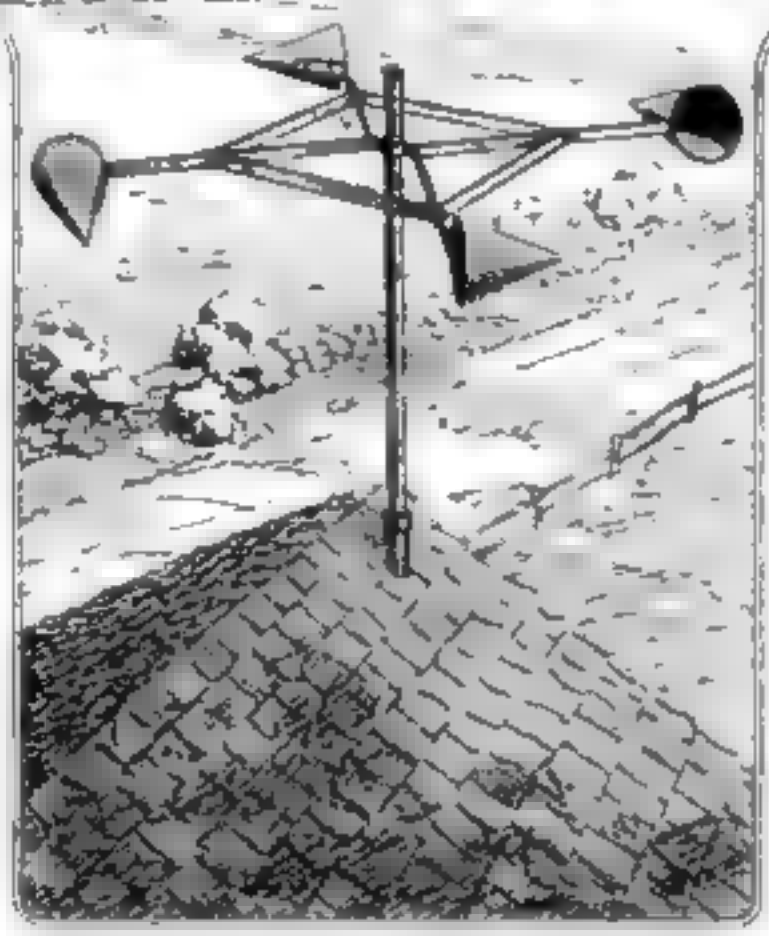
THE service of tires will be abbreviated to a considerable extent, if cuts, punctures, and snags are neglected. Too much care cannot be exercised in avoiding injuries of this nature as much as possible or, at least, in giving them the proper attention within a reasonable period.

New macadam roads, especially when wet, are liable to damage rubber covers. It is recommended that the speed of the car be slightly accelerated and the clutch depressed before coming up to loose, crushed stone in the road.

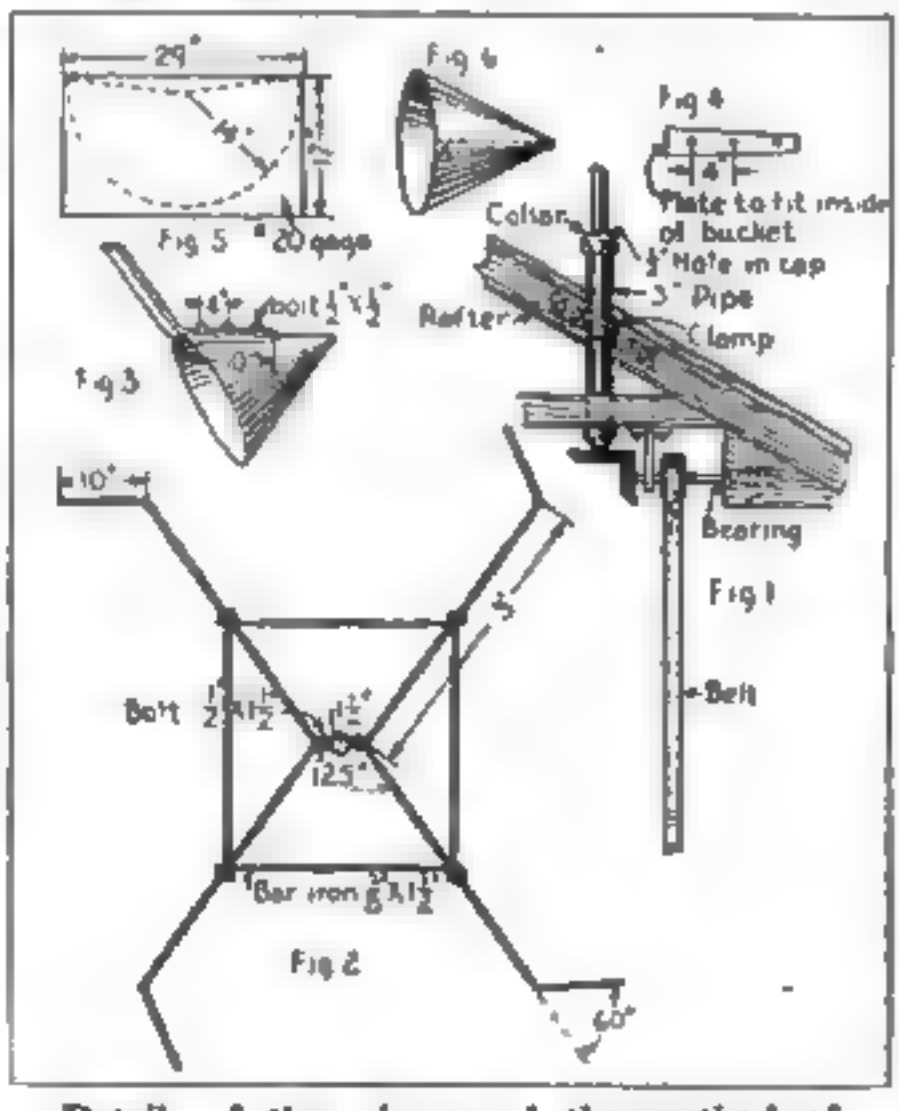
A Bucket Type Wind Motor

By O. B Laurent

THE necessary power to drive small machinery in the repair shop may be obtained by the use of a windmotor as shown. Such a motor may also be used to operate pumps and electric generators for charging storage batteries. The device is easy to construct and is inexpensive, the material being obtained from any hardware store. The driving connections, such as the beveled gears and hangers may be obtained from old, discarded machinery. An old mowing machine will furnish the bevel gears. A piece of 1½-in. pipe will serve for the main shaft, the length depending on the position in which the motor is set in the roof; the buckets, however, should be at least 4 ft. above the roof to obtain the best results. One method of transmitting the power from the motor is shown in Fig. 1. However, the builder may choose any method that will better suit his purpose. The object of the drawings is to show the construction of the motor and installation of the buckets at the proper angles, as shown in Fig. 2. The construction of the cross-arms may be readily understood from the illustration. The method of fastening the buckets to the arms is shown in Fig. 3, using plates, Fig. 4, on the inside of the buckets. The pattern for the sheet-iron to form the buckets is shown in Fig. 5. Mark out the sheet as indicated by dotted lines and then cut it out, which will allow for a ½-in. lap. Next shape the sheet as shown in Fig. 6, and punch the hole to receive ½-in. bolts. The buckets are then bolted to the cross-arms, using the plates, Fig. 4, on the inside. The cross arms and buckets are now complete.



The manner of mounting the wings of the wind motor on the roof of the shop



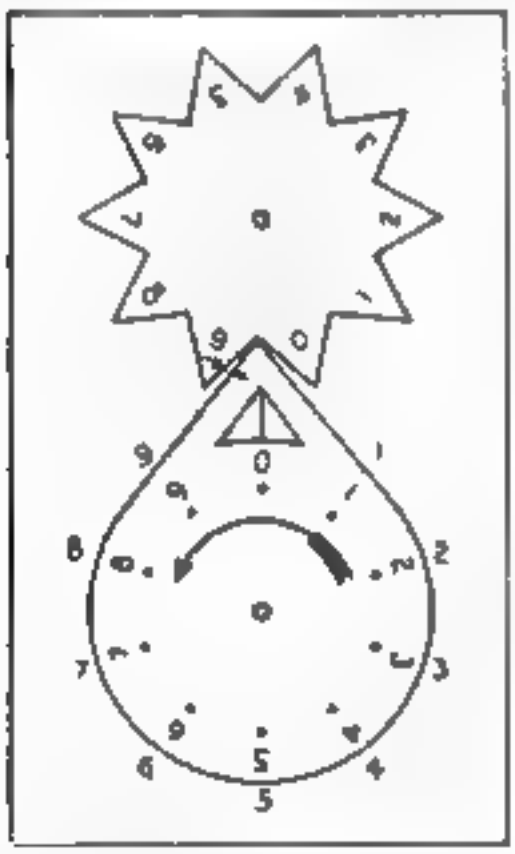
Details of the wings and the method of forming the buckets and the bevel gear

The bearing to receive the main shaft is made of a piece of pipe 3 in. in diameter with both ends threaded to receive ordinary pipe caps. Drill holes 1¾ in. in the center of the caps, to receive the shaft. The completed bearing is fastened to one of the rafters as shown in Fig. 1. The shaft is run

through the bearing, collars being used to hold it in place. The cross-arm is bolted at the end of the shaft, care being taken to screw the nuts up tightly so that the arm will not slip on the shaft. The bevel gears and pulley may be fitted, using an ordinary shaft hanger next to the gear. The other bearing may be made by using a pipe nipple filled with babbitt metal and bored to fit the shaft. It is then fastened with screws to a rafter. The dimensions given are for a motor of small power, but they may be increased proportionately for a higher powered motor. The motor will always revolve in the same direction, no matter from which point the wind may be.

Making an Adding and Subtracting Machine of Cardboard

IF our brains performed arithmetical labors in the same way that calculating machines do their work we should certainly have wheels in our heads, for circular motion is the basis of every practical calculating device. Since our system of numbers has ten for a basis almost all the engaging wheels of computing machines have teeth that are ten or a multiple of ten in number for convenience.



Numbered cardboard wheels for the adding machine

The first step in the construction of the adding machine herein described is to divide the circumference of a circle into ten equal parts. There are scientific ways of doing it, but trial measurements with a pair of dividers on the circumference will soon produce a close approximation. To construct the machine you will need a smooth board 5 in. long, 4 in. wide and ½ in. thick; some heavy cardboard—the stouter the better—for the two number wheels; two flat-headed wire brads for axles, and a wire nail about 1½ in. in length.

To make the lower wheel of the machine draw a circle on the cardboard 2 in. in diameter, then draw two tangents that meet at a point beyond the circle. Divide the circumference into ten equal parts and number in black ink the division points as shown. Following the lines of the tangents with scissors cut out the pear-shaped figure, and with a sharp knife make a small triangular opening in the V-shaped projection.

The other wheel of the machine is also 2 in. in diameter and the circumference is divided into ten equal parts. Describe a concentric circle about ¼ in. inside of the outer circumference, then carefully cut the teeth as shown. To do this with precision you should also divide the inner circle into ten equal points and make marks midway between the division marks of the outer circle. Using these marks for guides you will have no difficulty in cutting the teeth accurately. Number the second wheel in ink from 0 to 9 inclusive—a number on each tooth.

The machine is now ready to set up. Fasten the cogwheel first. Place it on the board in such a position that the teeth do not overlap the upper edge and fasten it by one of the brads driven through the center, drawing it well down against the pasteboard, but not too tight to prevent it from turning easily.

With a pin for a temporary axle, determine the proper position for the lower wheel. It should be such that when the wheel is turned the projecting point shall engage the teeth of the upper wheel, but will permit them to pass without cramping. When the position is correct, drive a brad through the center to make all parts secure.

Mark the board with the numbers shown. Use a soft pencil and be guided by the numbers on the lower wheel. Draw a pencil guide line between the two wheels so that it will appear through the triangular opening. In addition the small arrows, one on the point of the lower wheel and the other on the cog number 9 of the upper wheel are drawn. Make deep indentations on the lower wheel on the inside of each of the numbers with a rather dull knife. These serve as a holding place for the point

of the large wire nail that acts as a sort of a movable handle. The machine is set when the points of the arrows are exactly opposite. The lower wheel always turns from left to right. It is now ready for adding a column of figures. Take the figures 8, 9, 6, 9, 8, 7, 7, 9, 3 and 2 and add them. Insert the point of the wire nail in the indentation of the lower wheel opposite the number 8 of the board. Pay no attention to the numbers on the wheel until you finish adding. Turn the lower figure wheel with the nail until the point is opposite the guide line. Lift the nail and place the point in the indentation at number 9 of the board and turn the wheel until the nail is opposite the guide line. Again lift the nail, insert the point opposite the number 6 of the board and turn the wheel until the nail is once more opposite the guide line. Add the other figure in the same way. The sum total of the column will appear at the opposite ends of the guide lines, namely, 68.

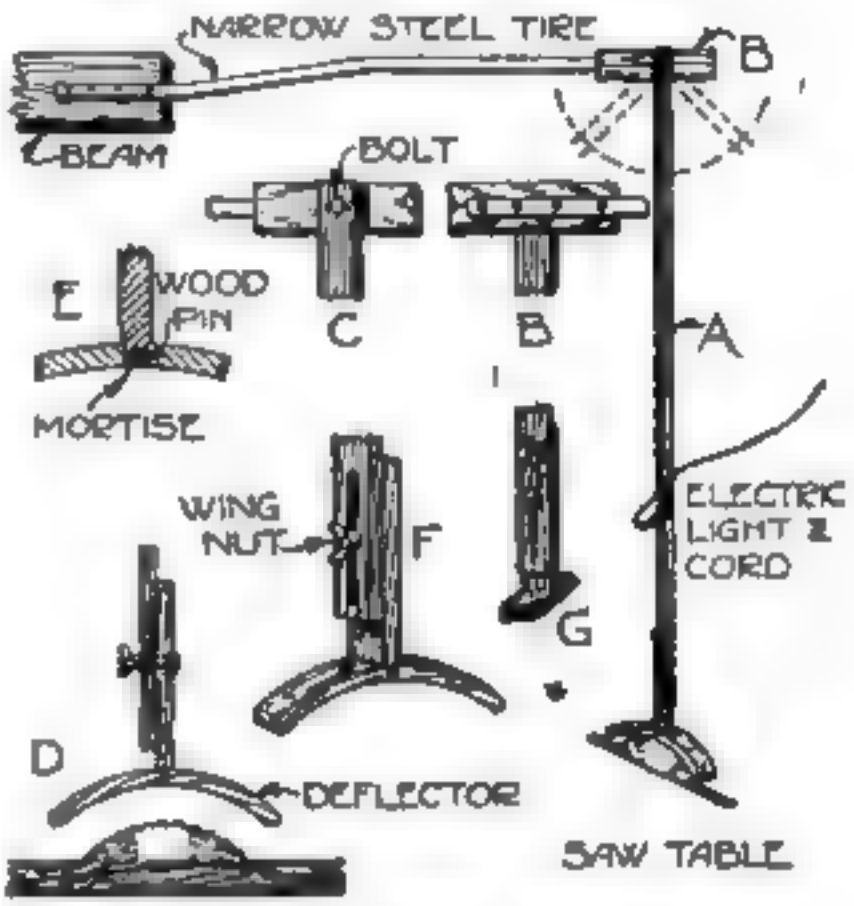
The capacity of the machine is 100, but by keeping tally of how many times the cog number 9 passes the guide line, you can use the machine for any column of figures. This machine is also a subtracting machine. To subtract with it, set the upper wheel so that the first digit of the minuend appears at the guide line, and then set the lower wheel so that the second digit of the minuend also appears at the guide line. Now place the nail opposite the subtrahend marked on the board and move the lower wheel clockwise—in the opposite direction to that indicated by the arrow—the number of spaces equal to the subtrahend. As in addition, the result appears at the guide lines. When there are two digits in the subtrahend place the nail in the hole opposite the digit on the board and, as in the first case, turn the wheel a number of spaces equal to the subtrahend.

The subtracting numbers of one digit, the zero mark on the upper, or tens, wheel must be set on the guide line, since the tens place is not represented in the minuend.

This machine is not difficult to make, and it will be found very convenient by anyone who does much figuring but not enough to warrant the purchase of a machine.—E. P. THORNTON.

A Simple Sawdust Deflector for a Circular Saw Bench

TO do away with the confusing spray of dust which a circular saw throws up, particularly when cutting heavy lumber, a wheelwright made the adjustable sawdust deflector, shown in the illustration, to cover his circular saw. A length of narrow tire steel was bolted to an overhead beam and bent so as to bring it over to the saw as shown. This supports the vertical arm, *A*, of the deflecting device. A short section of wood, *B*, was bolted to the end of the tire steel, and to this in turn, the vertical arm was secured by a bolt, *C*, which permits the deflector to be swung away from either side of the saw table.

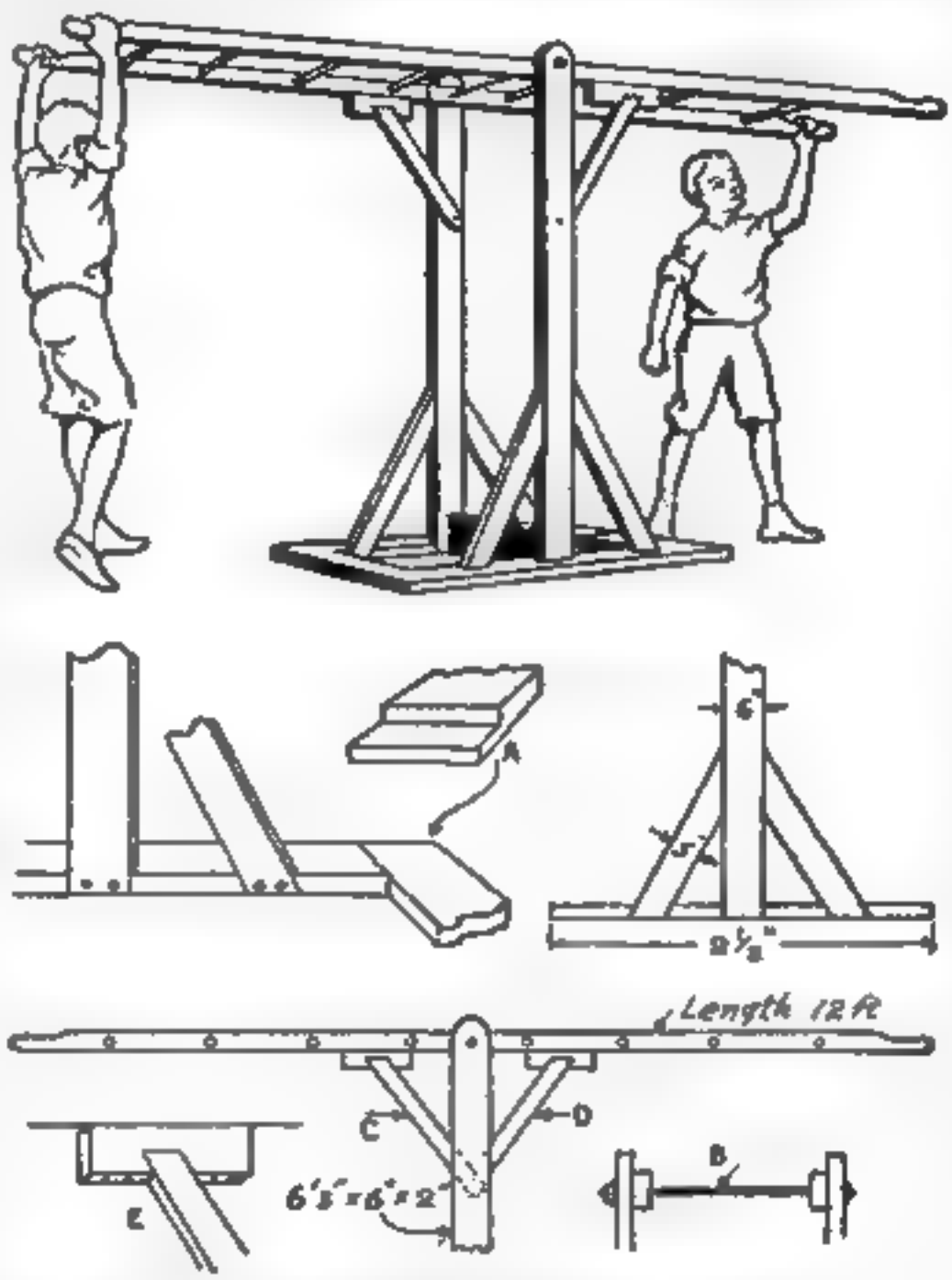


The parts for making an overhanging sawdust deflector for a circular saw table

The deflector proper, *D*, consisted of a curved piece of wood 2½ or 3 in. wide and about 1 in. thick, mortised to a 12-in. vertical section of the same width. In order to eliminate any chance of accident due to cutting through of the deflector, a wood pin instead of a bolt was used to secure the mortise and tenon *E*. Vertical slots in the ends of the arms *F* and *G* permitted the travel of the wing-nut used for raising and lowering the deflector. Hanging a light on the deflector arm made it possible to adjust both arm and light in one operation.—JAMES M. KANE.

A Balancing Ladder for Use in the Home Gymnasium

THE balancing ladder was designed for indoor use. In making it care should be taken to have all the parts properly finished so that it will look neat, as well as give good service. The base consists of a frame made of 2 in. plank and when finished it forms a rectangle 30 by 48 in. The joint used at the corners is shown at *A*. The upright planks are 6 in. wide and are fitted into notches cut on the inner edges of the platform pieces. The braces for the uprights are fitted to their own depth.



A portable balancing ladder and details of its principal parts. The ladder is tilting or made solid

The ladder proper is made of sound, straight-grained hardwood, with each rung glued and nailed in place. The pivot is made of a bolt as shown at *B*. When it is desired to maintain the ladder in a horizontal position, the braces *C* and *D* are let into the notches in the blocks as shown at *E*. The lower ends of these braces are bolted to the upright post and may be quickly taken down. When the device is completed, smooth all parts with sandpaper and apply two coats of spar varnish. For permanent locations, it may be bolted to the floor, but it is preferably left portable. The construction permits this and only ordinary care is necessary to prevent accidents. For healthy, growing boys this apparatus will provide endless fun and exercise.—A. ALDON.

Mounting Photographs So That They Will Not Curl

THERE are very few amateur photographers who have not encountered the unpleasantness of pasting photographs on mounts and have them curl up, mount and all. The dry mounting method overcomes this difficulty, but one must have a hot iron. However, the difficulty may be overcome by the use of rubber cement such as is used for patching the inner tubes of bicycle and automobile tires.

The cement is applied in a thin, even coat on the back of the print and the face of the mount. It is allowed to dry, or become "tacky" before placing the print on the mount. When the print is laid in place it is rolled down just as in ordinary mounting.

As the cement will slightly discolor the mount, if it is white, it is best to cover the entire surface, then when the print is in place the uncovered border may be easily cleaned of the cement by rubbing with the finger end. Roll it into a ball and use the ball to clean the edge near the print. If any of the cement gets on the face of the print it can be rubbed off in the same manner.

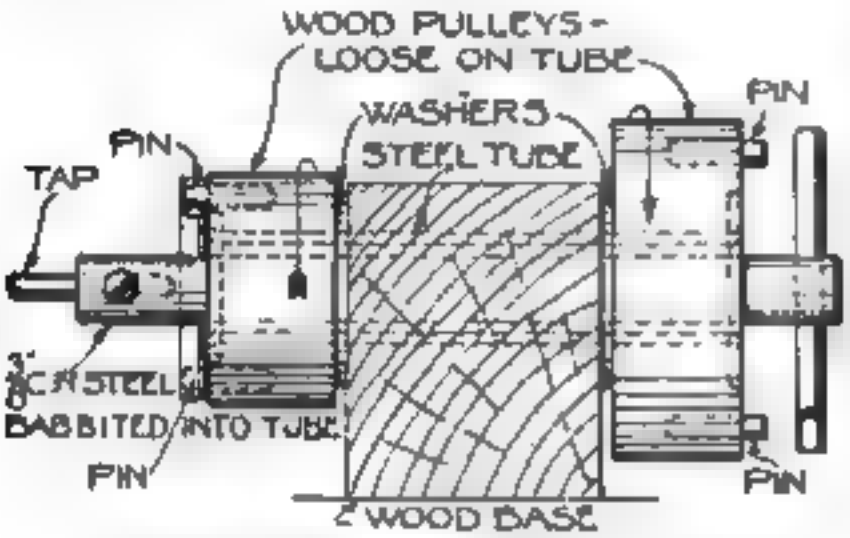
If the print does not stick properly it is because the cement was not left long enough before the print was applied to the mount. Dry the print well after mounting, so that the surface of the mount will not peel off in removing the cement.

Tricks of the Trade

A simple means of driving taps by power and a small vise for the work bench

Homemade Power Tapping Machine for Rapid Work

As it was necessary to tap several thousand ¼-in. holes in many cast iron fittings some means of driving the tap had to be provided. There was no tapping machine in the small shop, but



Opposite revolving pulleys drive the tap in either direction according to the pressure

the foreman was equal to the occasion and quickly made the tap driver shown in the illustration. The shaft was made from a piece of steel tube about 6 in. long and ⅝ in. outside diameter. Two wood pulleys were fitted to this shaft, one on each side of the bearing or support. One of the pulleys was turned to 3 in. in diameter and the other to a 2-in. diameter. A countersunk washer was fitted into the two outside faces of these two wheels and the edges of the pipe were beaded out to prevent them from slipping off.

Before attaching the pulleys, a piece of cold rolled shafting ⅜ in. in diameter was centrally babbited into the tube. This shaft was then provided with a central hole at one end to accommodate a tap, which was secured with a grub screw set into a slight depression ground into the tap shank. The shaft is provided with a carrier or dog at each end as shown. These dogs engage with the pins fitted into the outside surfaces of the pulleys.

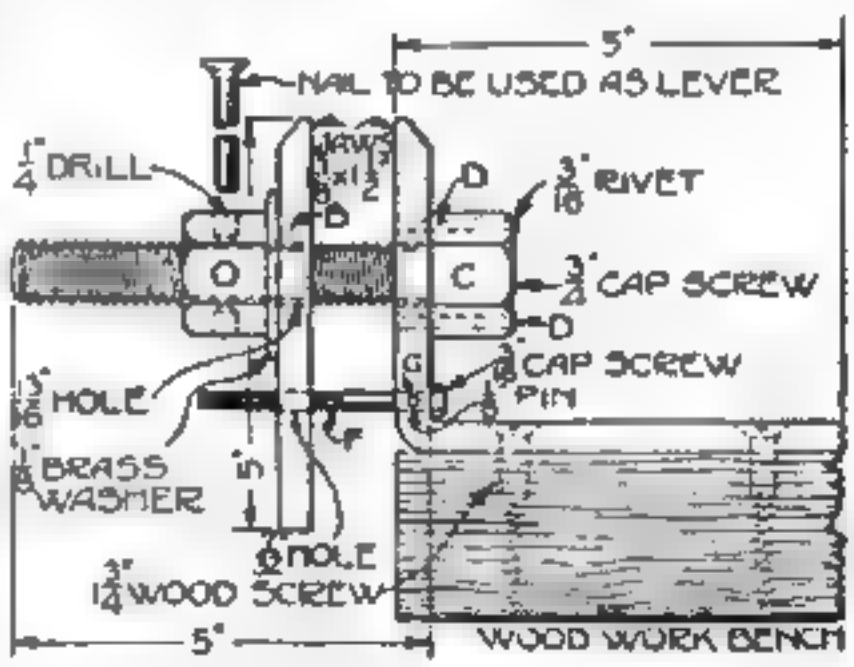
The shaft is arranged to slide axially inside the tube, the amount of the sliding motion being so proportioned that when one set of pins engages one of the dogs, the other set of pins is disengaged.

The smaller pulley was used to drive forward and the larger one for backing up. It will be seen that on pressing the work on the tap, the shaft is pushed back and so engages the pins at the front of the machine on the small pulley. Pulling outward on the work draws the shaft out and thus disengages itself from the pins on the small wheel and immediately engages with those on the large wheel, which revolves in the opposite direction, backing the tap out of the piece.

The tube was held stationary in a wooden block fastened to the bench. One of the belts was crossed. The surfaces of the pins where they engage were filed flat to make them act promptly.—JOHN L. ALLEN.

A Homemade Bench Vise for Small Work

THE illustration shows a cheap and quickly-made small vise for the model maker. It is suitable for any medium and light work. The vise is made from two pieces of band iron 1½ in. wide and ⅜ in. thick, with the jaw *A* bent as



Two pieces of metal and a cap screw with guide pin makes a model maker's vise

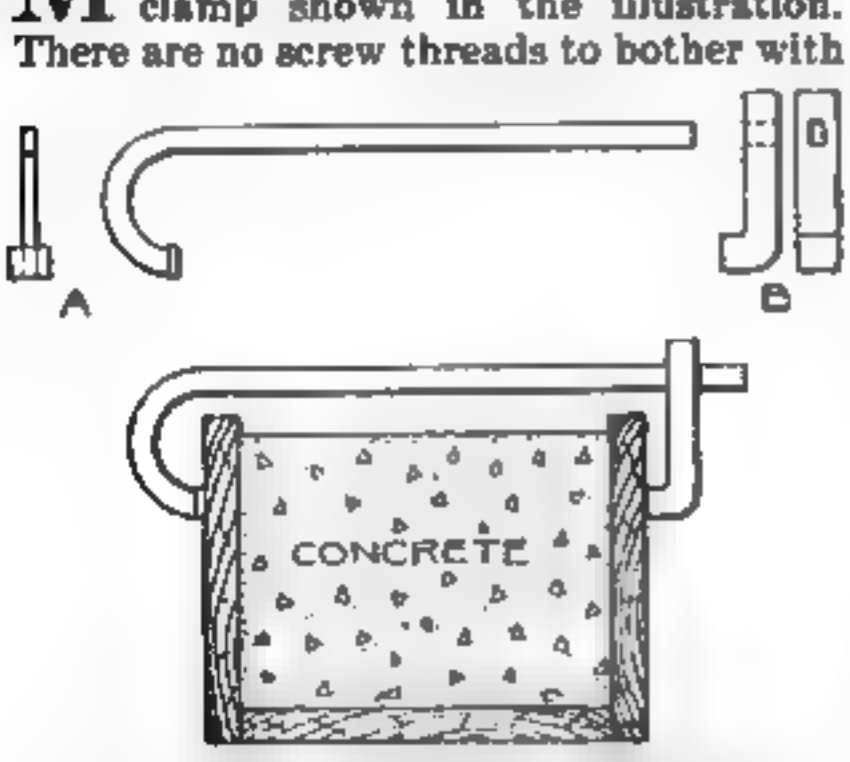
shown and the jaw *B* cut straight, with two holes drilled in it. The top hole is 13/16 in. in diameter and the one matching it in the top of the jaw *A* is ¼ in. in

diameter. The cap screw *C* is fastened with two rivets, one at the top and one at the bottom, to the jaw *A*. The rivets *D* are countersunk on the inside of the jaw. The brass washer on the outside of the jaw *B* is made of an old piece of ⅛-in. brass, and allows the nut *E* to draw up tight and hold it in position. It is not necessarily round.

Drill ¼-in. holes in the faces of the nut *E* and cut off the end of a nail to fit the holes. This is used as a lever for tightening the nut. The nut may be drawn up very tight, when necessary, with a wrench. The 3/16-in. cap screw *F* is held in the jaw *A* with a ⅛-in. taper pin, as shown at *G*, and this bolt acts as a slide guide for the jaw *B*, which holds it in a vertical position. The lower hole in the jaw *B* is 7/16 in. in diameter—large enough to slide over the threads on the bolt *F*.—P. P. AVERY.

An Easily Operated Clamp for Concrete Forms

MANY uses may be found for the clamp shown in the illustration. There are no screw threads to bother with and there is but one moving element. A contractor can have a number of these made by the local blacksmith or machine shop and use them in construction work of any character.



An easily constructed clamp for holding the forms in making concrete structures

A cold rolled bar, 1 in. by ⅜ in. in diameter and about 3 ft. long should be heated and forged at one end into the shape shown on *A*. A short bar, 1 in. square and 10 in. long, should be fashioned similar to *B*. The hole in the latter should be just large enough to allow *A* to slip through with a close fit. It is the lever action which, pressing the diagonally opposite edges of the hole against the bar *A*, causes the bar *B* to wedge and hold. The greater the pressure tending to force the clamp jaws apart, the greater the holding resistance.

In building a large concrete structure, a contracting company used hundreds of these clamps for holding temporarily in position the wooden forms for beams, window sills, and stairways. A great saving in time as well as money was made, as they did away with the old method of nailing wooden cross-pieces to the forms. They are easily portable and may be moved from one job to another as soon as the concrete sets.—K. M. COGGESHALL.

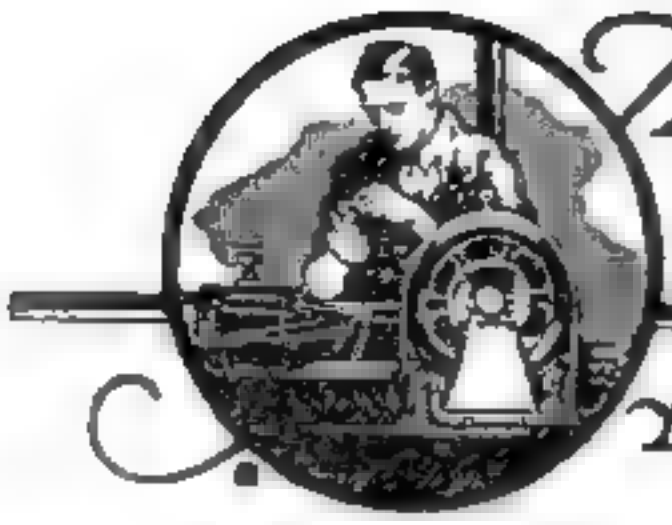
A Receptacle for Holding Graphite in a Clean Way

EVERYBODY knows how hard it is to pour graphite from any ordinary container without having it spill or come out too fast and make everything black. If the graphite is put in a discarded tooth-powder can (the kind with the regulating slot in the top) not only can its flow be regulated but it is kept clean and dry.

A Simple Homemade Sun Drier for Fruits and Vegetables

SUN drying is undoubtedly the simplest and most inexpensive method of preparing fruits and vegetables for winter storing. A simple drier that can be made at small cost consists of a shallow box with a sash or piece of glass fitted over the top. Bore holes in the sides and near the top and bottom, for ventilation; but cover them carefully with netting to keep out flies and mosquitoes.

Set the box at an angle so that the sun's rays fall directly on the glass. Apples, peaches, apricots, cherries, raspberries, and almost all fruits can be dried in this way satisfactorily. First wash the fruit carefully, discarding any that show signs of being over-ripe or decaying. Slice thin, and lay out in the box without overlapping the slices. Turn the slices occasionally and take them out as they dry. The only thing to guard against in this type of drier is dust and insects.

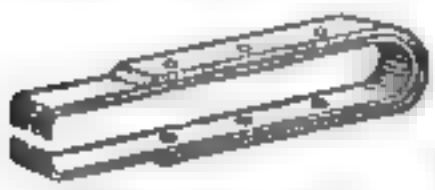


The Amateur-Electrician

And Wireless Operator

A Clip for Removing Insulation from Wires Quickly

IN the accompanying sketch is shown a handy device for making the operation of removing the cotton or other insulation from electrical conductors easy and efficient. The clip is very simple to make as it merely consists of a piece of steel 1/16 in. thick and ¾ in. wide, bent into the required shape, as shown, then ground and tempered at the cutting edge. Triangular notches are ground or filed in the cutting edge before tempering, make the operation of pulling the insulating material from the wire easier. As a protection to the hand, it is advisable to cement or rivet a piece of leather to the strip.—PETER J. M. CLUTE.



The sharp edge removes insulation quickly and evenly

A Depth Indicator for a House Water Tank

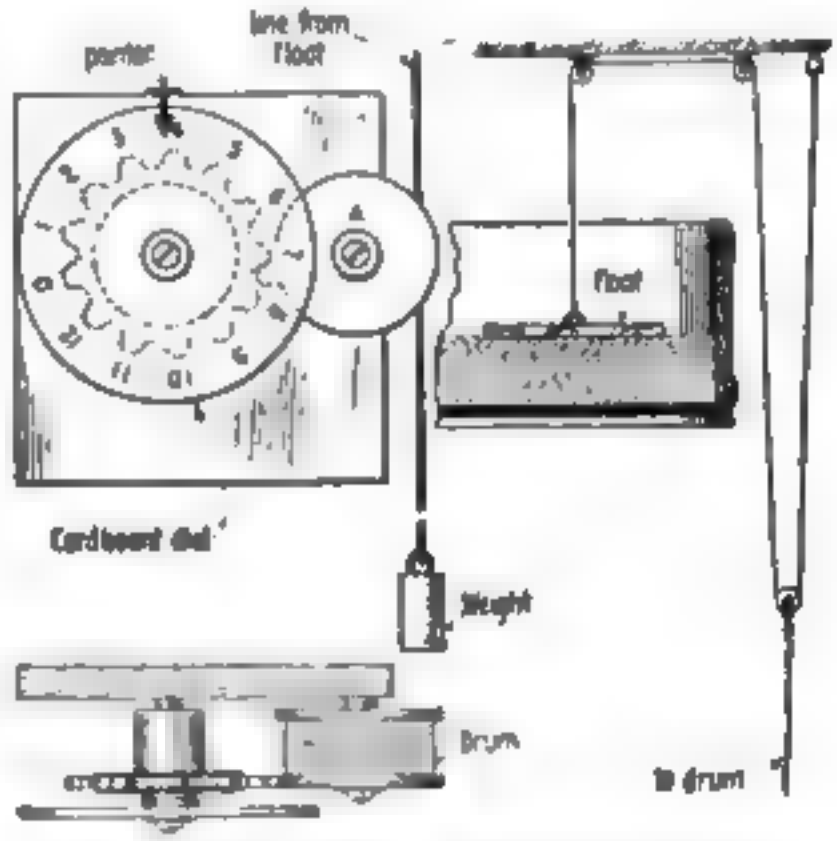
THIS depth indicator was built to automatically gage the depth of water in a small house tank and was built entirely of odds and ends of the kind found about any work bench or household.

A drum was made of a cylindrical piece of wood 2 in. in diameter furnished with two rims of cigar-box wood 2½ in. in diameter. The top rim was then cut down to the diameter of 2 in. except at one point where a tooth was left projecting out ¼ in. and about the same width, as shown at *A*.

A second disk 2½ in. in diameter was then cut from cigar-box wood and its circumference serrated with 13 teeth similar in size to that on *A*, and the space between them sufficiently wide to fit well over it.

The drum was then drilled through the center and mounted as shown on a solid base so to revolve easily about the screw in the center. The toothed disk was then glued to a length of a large spool to bring it in line with the tooth on *A* and mounted on a pivot so the teeth would engage readily without binding. The tooth disk was pivoted in the center of the base.

A card-board disk was then glued over the toothed disk, their centers being placed concentrically. This card-board disk was then pointed off with 13 equidistant marks, each mark lying directly over a tooth of the gear underneath. They were then numbered from 0 to 12,



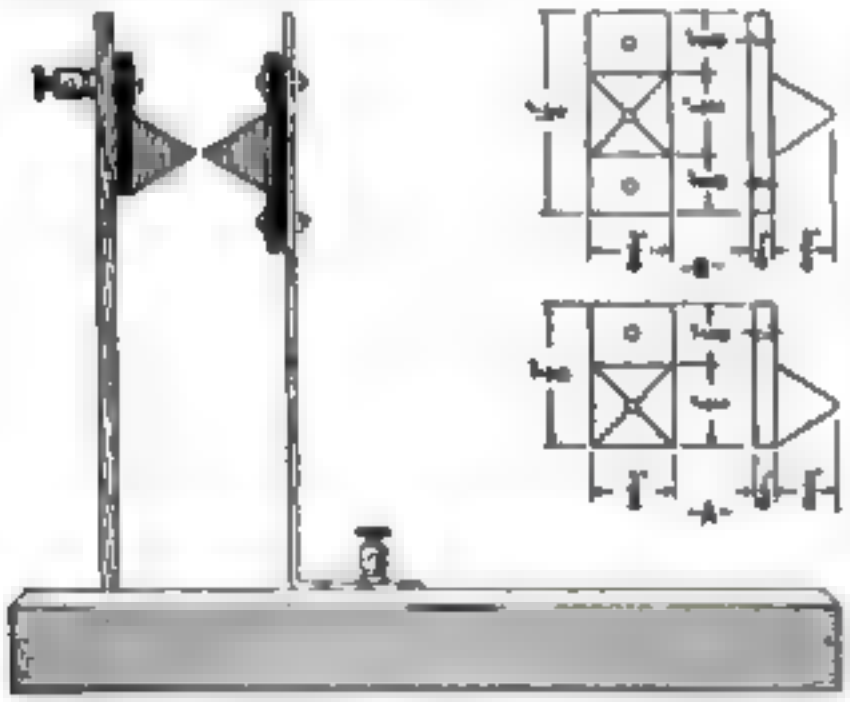
Drum and float with an indicating wheel to show the water level within a small tank

the tank being 12 ft. in depth. A metal pointer was fastened to the top of the base so it pointed down and over the card-board dial as far as the numbers.

Next a flat board was placed in the tank as a float and a stout line led from it over little pulleys down to the drum on the indicator where it was wound around several turns. A heavy weight was fastened to the lower end of the line. The length of line on the drum was a little more than the total depth of the tank. With the float on the bottom of the tank the dial was set so the pointer rested over O. Then, by means of the pulley system, every foot rise in the level of water revolved the drum once, which moved the engaged gear one tooth, representing one foot of water. When the level of the water lowered through use the action was reversed.

A Combined Microphone and One-Way Telephone

A SIMPLE, but fairly powerful microphone may be constructed by the amateur very inexpensively. It may also be used as a one-way telephone for experimental purposes.



The two carbons as they are mounted on the base to make the sensitive microphone

The base is constructed from white pine, and is 3 by 4½ by ⅝ in. The edges are beveled, and a groove is cut on the top to receive the sounding board. This board is made from the same material, and is 2½ by 4½ by ⅛ in. The illustration makes clear that it must be perpendicular to the base of the instrument. It should be carefully glued in place and permitted to dry thoroughly. Then the whole thing should be shellacked, or coated evenly with a thin coat of varnish.

It is necessary to procure an old worn-out dry cell for the construction of this piece of apparatus. The carbons are taken out and shaped as indicated by *A* and *B* of the accompanying sketch, and small holes drilled in them, as shown, to accommodate the two screws and the binding-post. The two tetrahedral-shaped carbons are placed directly opposite each other and their respective bases should be exactly parallel to each other. The carbon that is opposite to the one attached to the sounding board is held in place by means of a copper or brass strip which is so constructed that it enables the builder of this instrument to make it of any width he chooses as long as it is able to stand rigidly without any support, and is flexible enough to bend to and fro slightly in order to make adjustments when necessary. It is suggested that use be made of a buffing machine or similar apparatus in conjunction with an emery wheel, when possible, in order to cut the carbons to shape. However, if this is not possible, a sharp file can be utilized. The carbons should be adjusted so that the two points touch lightly. The instrument is then connected up with two dry cells and a 75 ohm receiver. The cord may be made 70 feet long for experimental purposes. If the specifications are carried out as herein indicated, it is possible to hear a person whistle or sing even though the receiver is 50 feet from the sounding board. A person walking in the room where the board is placed, can be distinctly heard.

Restoring Bichromate of Potash Used in Battery Solutions

BICHROMATE of potash used in electric batteries can be restored so that it can be used over again. The bichromate of potash battery in whatever form, is one of the most powerful and handy electric batteries to use where high-voltage and large current are required for a short time, for general experimental work. By treating the used up residue of bichromate of potash or bichromate of soda solutions which are thrown away as useless, they can be made to give electric currents over and over again. In order to give them a new lease of life the method is as follows:

In generating an electric current the bichromate of potash is converted into chrome alum, and all that is necessary to do is to convert it back again into bichromate of potash by fusing it with an oxidizer. Heat in a crucible, to incipient redness, a mixture of chrome alum (or chromium sulphate, if bichromate of soda was originally used), and nitre, using about equal parts of each and stir until the elements are fused. Test a portion of the fused mass by dissolving a small amount of it in water. If a pure yellow or an orange colored solution is obtained; the crucible may be withdrawn. If the solution is still slightly green, add more nitre. When the color is right, pour the material on to a stone or iron plate.

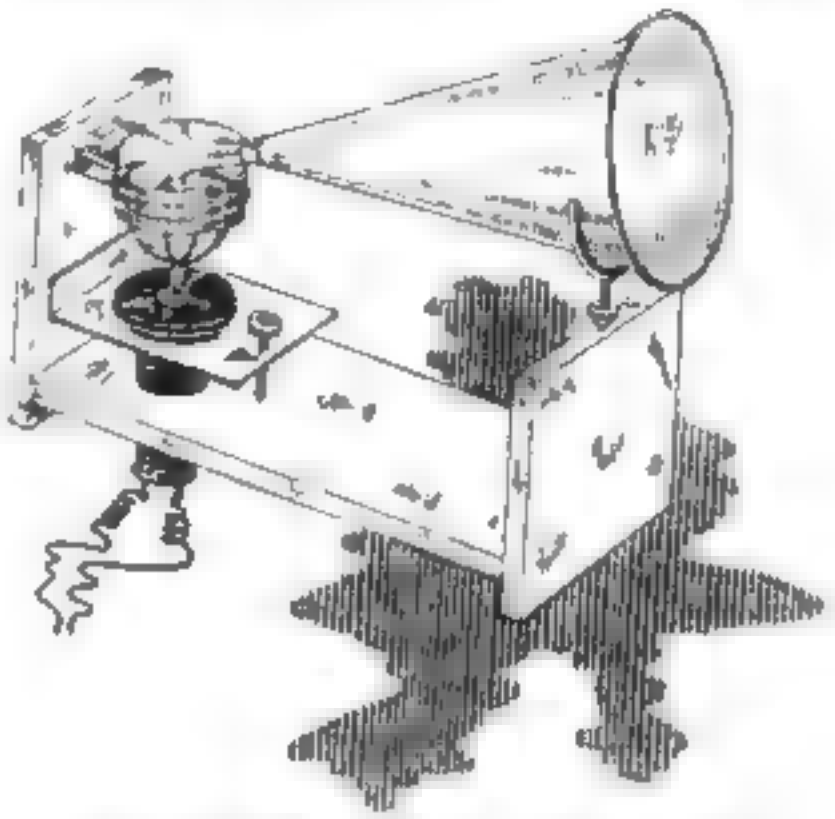
To make a battery solution, take a sufficient amount of the restored bichromate crystals and dissolve in water until the solution attains the strength that you usually make it. Then add the acid and your battery is ready for business again. Another mixture which is more quickly made, but less efficient, and one which I do not recommend, as it gives off a decidedly disagreeable odor, is to add chloride of lime to the used up solution. This must be done out of doors. The solution turns a greenish yellow, and a heavy deposit of sulphate of lime settles. Decant, and add fresh acid and you have a solution which will do for batteries which are kept in some barn or chemical laboratory, as the batteries will smell strongly of chlorine.

A Delicate Sound Amplifier for Telephone Receivers

TWO Danish inventors have patented in this country an interesting sound amplifier for telephone receivers. Though sound amplifiers are not new, the simplicity of this particular instrument has much to recommend it. Youthful investigators along electrical lines may want to make one like it with a view to learning something about the attractive field of sound and sound amplification.

The framework of the apparatus looks much like a small table book-rack. To the left standard a small board 4 or 5 in. square is nailed, and through a hole in the center of this the telephone receiver hangs, small end downward. It may even project through the base board of the "book-rack," but this does not matter, provided it clears the table beneath. A spring pushes up on the right-hand side of the receiver supporting-board, and through it a small set screw passes, so that the receiver's height can be slightly altered when necessary.

Near the top of the "book-rack's" left



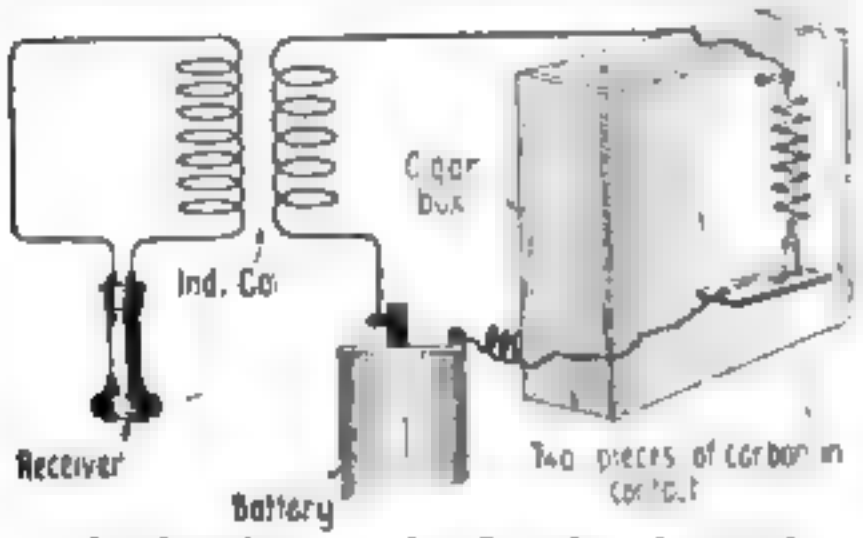
The telephone receiver mounted in a frame with a horn to make the amplifier

standard appears a hinged support for a sound box—this latter much resembling an ordinary metal pill box or other similar container. The horn is attached to the top of the soundbox, and across its bottom a membrane is stretched. A kind of a trunnion is attached to this membrane, terminating in the head of a pin or other small ball, which is intended to press against the diaphragm of the telephone receiver below. The several adjusting screws shown serve the purpose of adjusting the pressure of horn and sound box on the receiver diaphragm to give the best results.

Connected up with a telephone transmitter in the usual way or with a microphone, this type of apparatus will give unusual results. A microphone may be made by standing a cigar box upon end, and gluing a piece of carbon to the center of its bottom. Pressing on this, is another small piece of carbon, held up by a short length of coil spring made out of copper or other wire. The bottom of the cigar box acts as a sounding board, and if you talk against it, the carbons are vi-

brated sufficiently to act as a transmitter when connected in on the circuit as shown. Microphones may be made very sensitive, and, when combined with the sound-amplifying contrivance here described, should make exceedingly faint sounds audible.

The induction coil shown in the microphone circuit is not strictly necessary, but

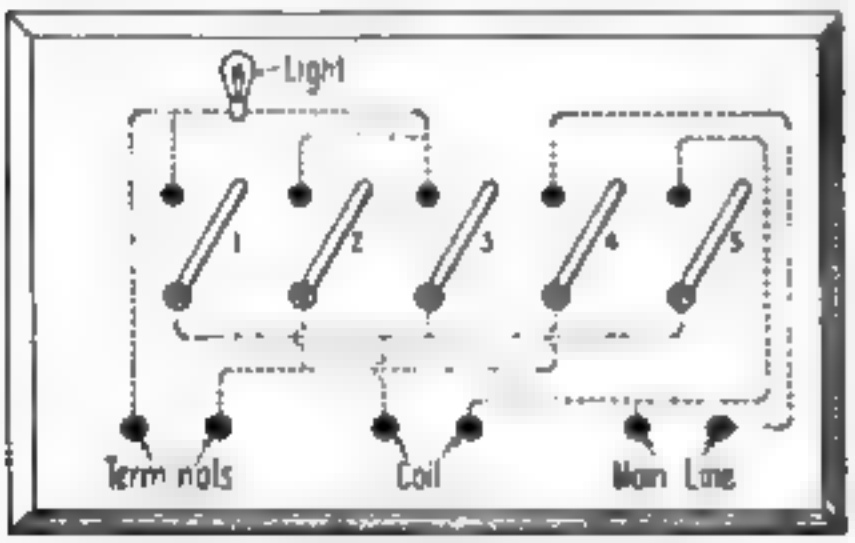


A microphone made of a cigar box and its wiring diagram to the induction coil

it will improve the operation of circuits. The primary (big-wire) side goes in the battery circuit, and the secondary (fine wire) side in that of the receiver. An induction coil of suitable size may be purchased from any telephone company.

Switchboard Constructed for Use in the Laboratory

THE illustration shows a simple combination of switches that can be used to flow a current of electricity in different strengths for making tests in a laboratory. The switches can be connected with the ordinary commercial line carrying 110 volts. Referring to the



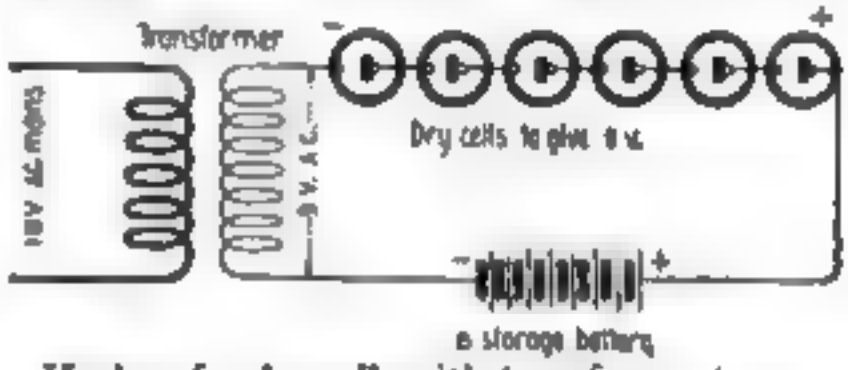
A combination of switches on a base for directing electric current for a laboratory

illustration, when 1, 4 and 5 switches are in contact, a straight current flows at the terminals. Switches 1 and 4 cuts in a series through the coil, and 3, 4 and 5 a series through the light. The switch 2 cuts the light into the circuit and 5 cuts the coil into the circuit.

A common arc light coil is connected to the terminals at the point marked coil and a 110-volt lamp at the place marked light.—T. I. DEKLE.

Alternating Current Charging Without Rectifier

IT is not absolutely necessary to have a rectifier with an alternating current for charging storage cells. Imagine that we have a 6-volt storage battery in need of charging and that the house mains provide current at 110 volts A. C. We hook in a bell transformer stepping down the voltage to nine volts as shown by the sketch, and then connect six ordinary dry-cells—new ones—in the secondary circuit, the dry cells being in series with the storage battery to be charged. It is es-



Hookup for dry cells with transformer to rectify alternating current for battery charging

sential to connect the carbon pole of the dry cell battery to the positive pole of the storage battery.

Now to show that the battery is actually being charged: Let us consider conditions when the direction of flow of the A. C. is the same as the direction of flow of the dry cells—for convenience we will call this direction positive. Our transformer gives us 9 volts in a positive direction; the dry cells another 9 positive, while the storage battery gives us negative 6. The algebraic sum or resultant voltage is plus 12.

Consider now the other or negative alternation. Our dry cells give us plus 9; our transformer minus 9 and our storage battery minus 6. Resultant, minus 6. In other words, on the positive or charging alternation, we have 12 volts acting to force current through the battery, while on the negative alternation we

have only 6 causing a discharge. The net result is a pulsating charging voltage of 6.

The more skeptical of us might think that all of the current effective in charging comes from the dry cells and that the alternating current is not effective. But if we connect the dry cells to the storage battery, we have 9 volts charging against 6 tending to discharge, giving us an effective charging potential of 3 volts or only half the value obtained with the alternating current arrangement.

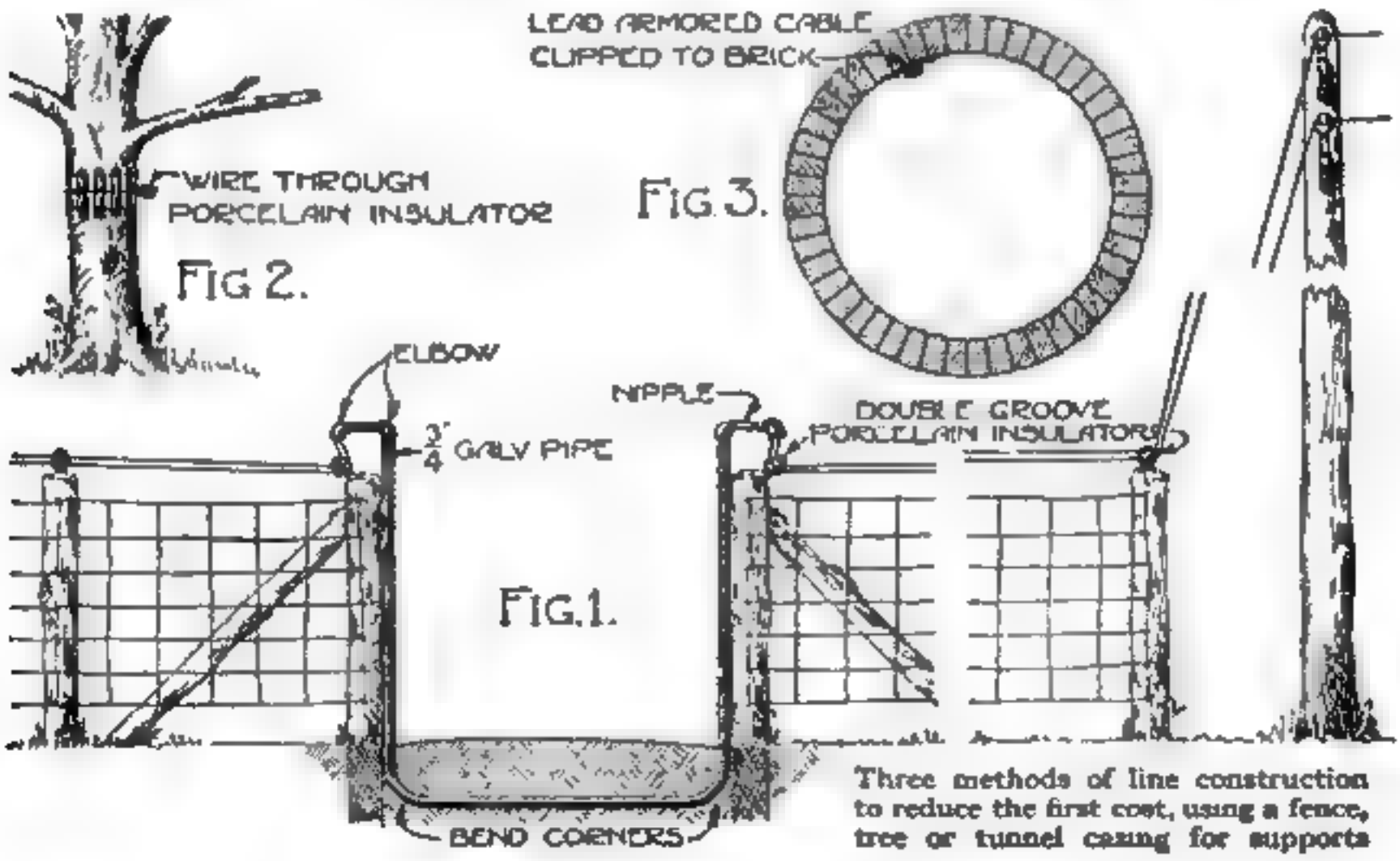
With the connections shown, the charging rate would be very low because of the high internal resistance of the batteries. Connecting several rows of dry cells in series parallel to provide the 9 volts would considerably hasten the charging. This method is recommended as a good one for use in connection with storage cells which have been sulphated, Bennett or Daniell cells taking the place of the dry batteries. The frequent alternations coupled with the low charging rate make for rapid correction of the sulphation.—E. F. HALLOCK.

Some Methods of Construction for Telephone Wires

AT the right side of the illustration Fig. 1 is shown a way of running a rural line along the top of a fence, the line wires being carried on insulators secured to the top of the fence posts. In the main part of Fig. 1 is shown how the wires are carried past a gate, and in Fig. 3 is shown how the wires are run through water-supply tunnels and large sewers; while Fig. 2 shows how large trees are sometimes used to support the wires and eliminate the cost of pole line construction.

When necessary to carry wires as shown in Figure 3, a regular lead-covered cable or an armored submarine cable is secured to the top of the tunnel or sewer by means of galvanized iron clips and brass screws which are driven into expansion shields. This method is generally used to supply service to a pump station or water intake which is situated out in the water some distance from the shore. When the water is quiet, as it is in a lake, the service is generally supplied by means of a regular submarine cable laid on the bottom of the lake; but when the cable must cross a swift-running river, it is advisable to put in the tunnel to prevent its being broken by the weight of water which would be constantly pressing against it.

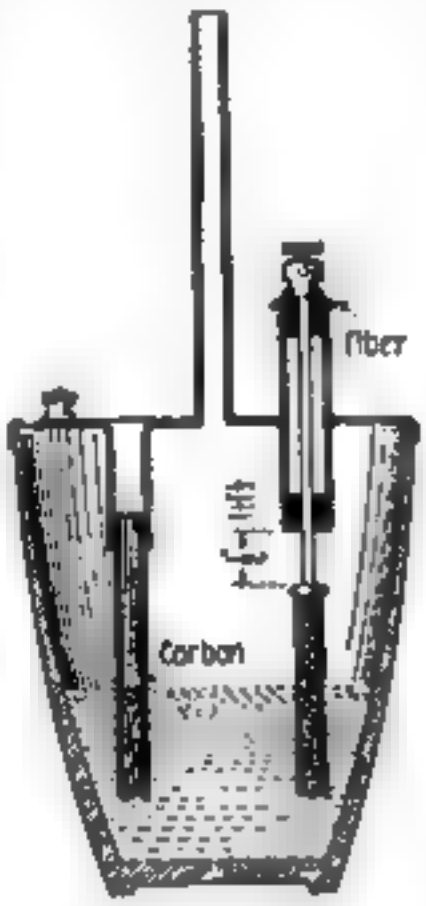
In Fig. 1 the ends of the pipe coming up from under the driveway are bent downward at the ends to prevent water from entering the pipe during rainstorms or from the dew and rotting the insulation from the wires.—GEORGE M. PETERSEN.



Three methods of line construction to reduce the first cost, using a fence, tree or tunnel casing for supports

An Electrically Heated Inhaler for Respiratory Troubles

SEVERAL home remedies for respiratory troubles are inhaled in the form of steam. The medicine is placed in boiling water, and the fumes are breathed through an inverted funnel. A much more satisfactory way of doing this, particularly at night, is to heat the fluid by electricity in the manner illustrated.



Jam jar fitted with necessary electrodes

The body of the apparatus consists of a cheap jam jar with a tin cover that fits on tightly. Two holes about the size of a lead-pencil are drilled, one in the center and one at the side, of the cover. A metal tube about 4 in. long is soldered over the central hole, and another piece of tubing about 2 in. long is slipped through the hole, near the side, and soldered in place with half its length extending upwards. Bush this tubing at the top and bottom with fiber or hard rubber, and have an ⅛-in. hole drilled through each bushing. A third piece of tubing 1 in. long is soldered on the underside of the cover diametrically opposite the 2-in. tube.

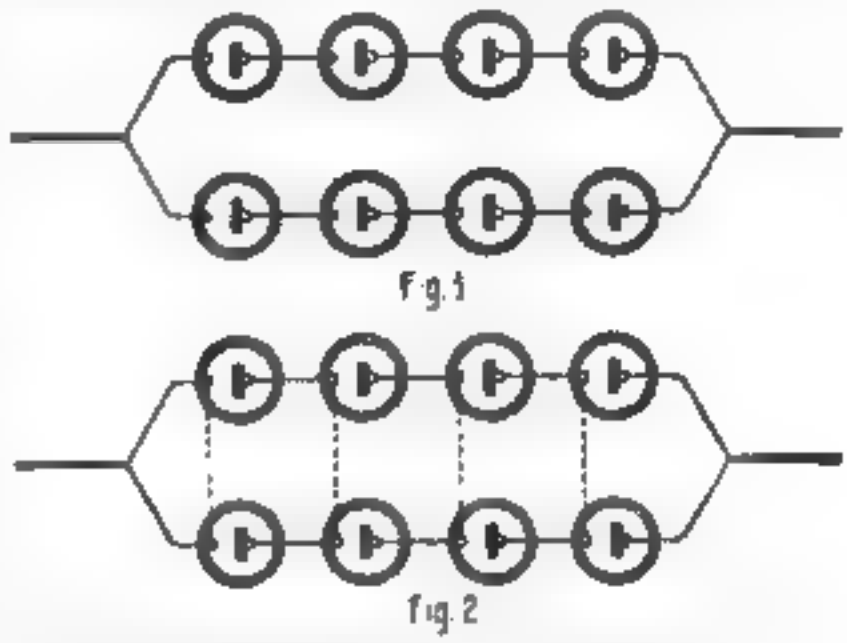
Remove the central carbons from two discarded flash-light batteries and thoroughly clean them. Remove the brass cap from one carbon and fit it tightly into the end of the shortest tube. Solder a rod or a large wire nail to the top of the brass cap on the other carbon. Slip this rod through the holes in the bushings, and cut it off after allowing ½ in. to project when the rod is raised as high as the carbon will permit. Finally solder a binding post or some sort of connector to the upper end of the rod. The lower ends of the carbons will now have to be trimmed off, so that when the cover is in place the stationary carbon will come within ⅛ in. of the bottom of the jar and the movable carbon will be at a similar distance when it is at its lowest position. After soldering a second binding post to the top of the tin cover, the inhaler is complete.

To test it, put in about ¾ in. of water, and connect it directly, without resistance, to the 110 volt current. Unless the water is unusually free from mineral salts, it should boil in one or two minutes. If it does not do this, add the slightest pinch of table salt. A steady stream of steam should now issue from the central tube, after which the adjustable carbon may be raised almost out of the liquid. Even though the temperature of the water rises gradually, there is no danger of breaking the glass. When everything is operating smoothly, drop the medicine down through the central tube with a medicine dropper.

It can readily be seen that with this apparatus the volume of the steam and the strength of the solution are always conveniently within control.

Ignition Hookup for Use on Automobile Circuits

ELECTRICAL ignition systems are generally operated on low voltages from primary batteries, storage cells, or small low pressure generators. The series-multiple connection shown in Fig. 1 is generally used.



A hookup to prevent a loose connection from rendering the entire series useless

If additional cross-connections are made, as illustrated in Fig. 2, it will be found that a loose connection in one series of cells will not render the entire series useless.—PETER J. M. CLUTE.

Electrical Devices and How They Work

V.—Principles of the induction coil and transformer

By Peter J. M. Clute, B. E.

IF a coil of insulated wire is wound around an iron core, as shown in Fig. 1, and connected to a battery circuit, and if another coil is wrapped about the same core and its terminals connected to any current detector, as shown in the illustration, it will be found that when the key is closed, the deflection

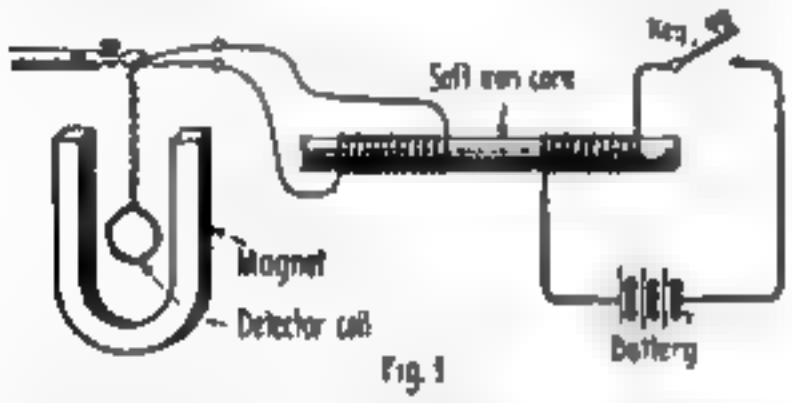


Fig. 1

Illustrating the working of an induction coil and alternating current transformer

of the detector needle indicates a temporary current induced in one direction through the left coil. However, when the key is released, an equal but opposite deflection will be an indication of an equal induced current in the opposite direction.

This simple experiment illustrates the fundamental principle of the induction coil and the alternating-current transformer. The right coil which is connected to the source of current, is called the primary coil, and the left coil, in which current is induced, is the secondary coil. This coil causes lines of force to exist inside of the primary coil—in other words, magnetizes the space inside of left coil, which is the core about which both coils are wound—and thereby causes an induced current to flow in left coil. Demagnetizing the space inside of left coil also induces a current in the coil. This is in accordance with Lenz's Law, namely, that any change in the number of magnetic lines of force which thread through a coil induces a current in the coil.

If half of the turns of the secondary are unwrapped, the deflection when the circuit is opened or closed will be found to be about half as great as before. Since the resistance of the circuit has not changed, it can be deduced that the E. M. F. of the secondary is proportional to the number of turns of wire upon it. This results from the principle that the E. M. F. induced in any circuit is equal to the rate of cutting of lines of force by that circuit. All the lines produced by the primary and which pass through the core, cut all the secondary turns. If, therefore, there are twice as many turns in one case as in another, theoretically twice as many lines of force cut the circuit, and hence the E. M. F. is twice as great. If, then, it is desired to obtain a very high secondary voltage, it is only necessary to build the secondary coil of a very large number of turns of fine insulated wire.

The induction coil, shown diagrammatically in Fig. 2, consists of an iron core *C*, composed of a bundle of soft iron wires; a primary coil wrapped around this core and consisting of a small number of turns of coarse insulated copper wire, connected to the battery circuit through the contact-point at the end of the screw *D*; a secondary *S* surrounding the

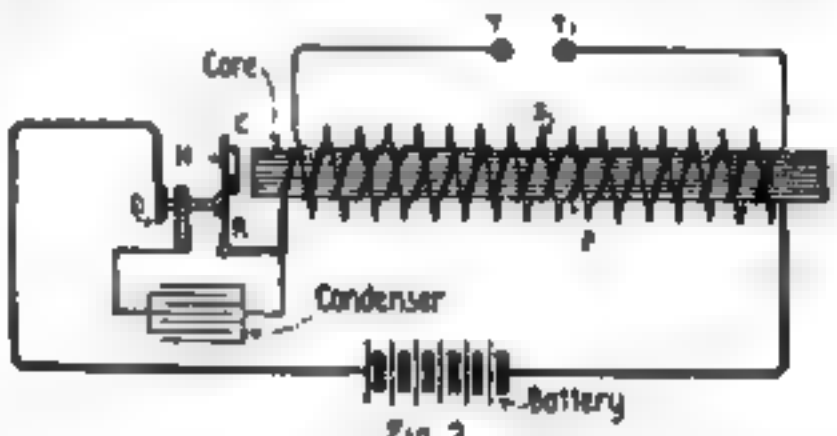


Fig. 2

A diagrammatic illustration of an induction coil with one wire coil on top of the other

primary is indicated, and consisting of a very large number of turns of fine copper wire, the terminals of which are *t* and *t'*; and an electromagnetic hammer *H*, or other arrangement for making and breaking the primary circuit.

When the primary is closed, the core becomes magnetized. Thereupon, the iron hammer *H* is drawn away by mag-

netic action from its contact with *D* and the current is thus suddenly stopped. This instantly demagnetizes the core and induces in the secondary an E. M. F., which is usually high enough to cause a spark to leap the gap between *t* and *t'*. As soon as the core is demagnetized, the

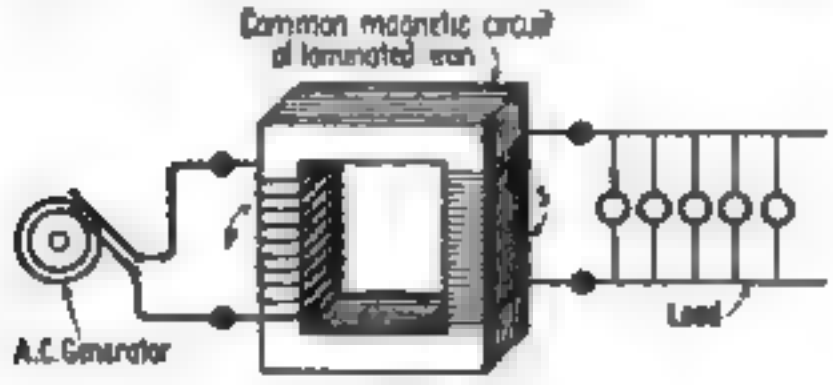


Fig 3

Form of a transformer core that keeps the lines of force in a continuous iron path

spring *R*, supporting the hammer, restores contact with *D* and the operation is repeated. The condenser, shown in the diagram, is not an essential part of the coil; but when it is introduced, it is found that the length of the spark sent across the air gap is considerably increased.

The commercial transformer is a modified form of the induction coil. The essential difference is that the core in Fig. 3, instead of being straight, is bent into some other form such that the magnetic lines of force have a continuous iron path, instead of being obliged to push out into the air, as in the case of the induction coil. Furthermore, it is always an alternating instead of an intermittent direct current which is impressed on the primary *P*. Sending such a current through the primary is equivalent to

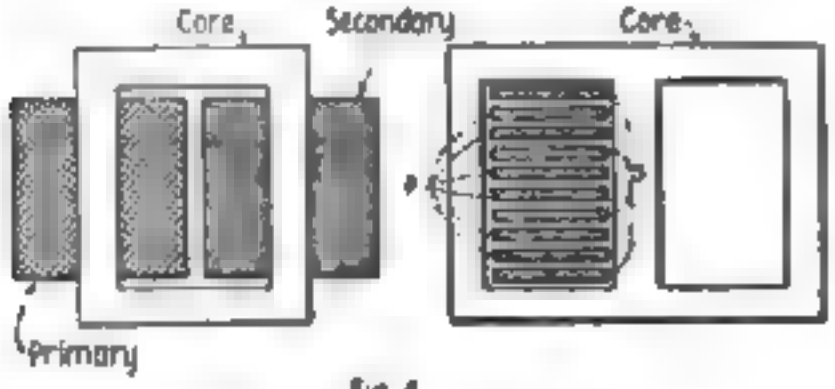


Fig. 4

Diagrammatic illustration of two general classes of transformers, a core and a shell type

magnetizing the core first in one direction, then demagnetizing it, then magnetizing it in the opposite direction, etc. The result of these changes in the magnetism of the coil is, of course, an induced alternating current in the secondary coil *S*.

If there are few turns in the primary and a large number in the secondary, the transformer is called a step-up transformer, because the voltage produced at the secondary terminals is greater than that impressed at the terminals of the primary, by the ratio of the number of turns of primary and secondary coils. Thus, an induction coil may be said to be of the step-up type. For some uses, however, transformers may be of the step-down type. For example, 2000 volts are impressed at the terminals of the primary, and a lower voltage, say 100 volts, is obtained at the secondary terminals. In such a case the primary will have 20 times as many turns as the secondary, and, we call it a 20 : 1 step-down transformer.

Assuming that the losses in the trans-

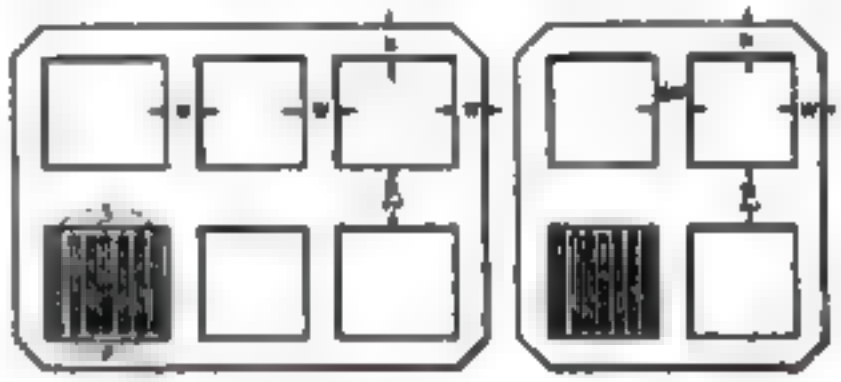


Fig. 5 Fig. 6

The usual arrangements of coils and core for a shell type polyphase transformer

former are so small as to be negligible, the same number of magnetic lines of force passes through both primary and secondary coils. Since the E. M. F.'s in the two coils are proportional to the number of lines of force multiplied by the number of turns in the coil, it follows that the E. M. F.'s are directly proportional to the number of turns of wire upon the two coils.

Transformers are divided into two general classes, namely, core transformers and shell transformers. These two types are illustrated diagrammatically in Fig. 4.

Transformers for two- or three-phase currents can be made by combining two or three single-phase transformers into one piece of apparatus. In certain cases, polyphase transformers are desirable, but general practice is to use two or three separate single-phase transformers for transforming polyphase currents. The usual arrangement of coils and core for

shell-type polyphase transformers is shown in Fig. 5 and 6. The three-phase type is equivalent to three single-phase transformers placed against one another. There are three distinct sets of coils, but the core forms a part common to all three. By combining the core in this way, a saving of iron is effected and the core loss slightly reduced.

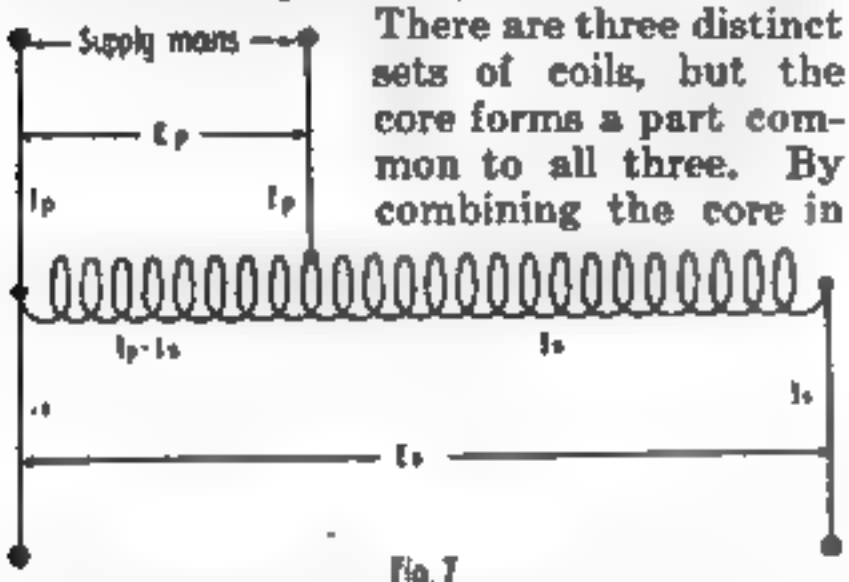
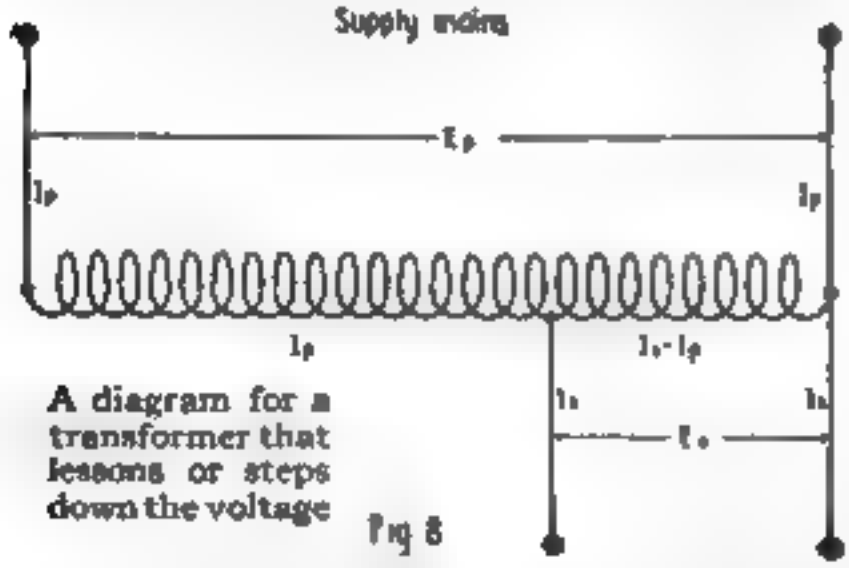


Fig. 7

A diagram for the winding of an autotransformer arranged to step up the voltage

A two-phase transformer gives but little saving over two single-phase ones, as is seen by reference to Fig. 6.

Another type of transformer often employed is the autotransformer. They differ from the ordinary type, in that they only transform part of the total power supplied to them. In addition, the primary and secondary coils are connected in series, instead of being entirely separated. In the autotransformer, power is partly transferred by direct electrical conduction from primary to secondary, and partly by means of the alternating field. In the ordinary transformer, the two coils are electrically separate, and neglecting losses, the total power supplied to primary is transferred to secondary through the medium of the alternating flux.



A diagram for a transformer that lessens or steps down the voltage

Fig 8

In Fig. 7 is shown a diagram of the winding for an autotransformer, arranged to step up the voltage, and Fig. 8, a diagram of one for stepping down the voltage. In the former the high-voltage mains are attached to secondary, while in the latter they are connected to primary.

Referring to Fig. 7 and 8, *Ep* denotes the primary E. M. F.; *Ip*, primary current; *Es*, secondary voltage; and *Is*, secondary current. Whatever the winding arrangement may be, the rule of voltage transformation is the same as for transformers having two insulated windings. Thus, if *Tp* denotes the number of primary turns, and *Ts* of the secondary, then, $Ep : Es = Tp : Ts$.

Neglecting losses, primary input equals secondary output, or $Ep\ Ip = Es\ Is$. Whence, $Is = Tp\ Ip \div Ts$.

Thus, the secondary current in the autotransformer is equal to primary current multiplied by the ratio of primary to secondary turns.

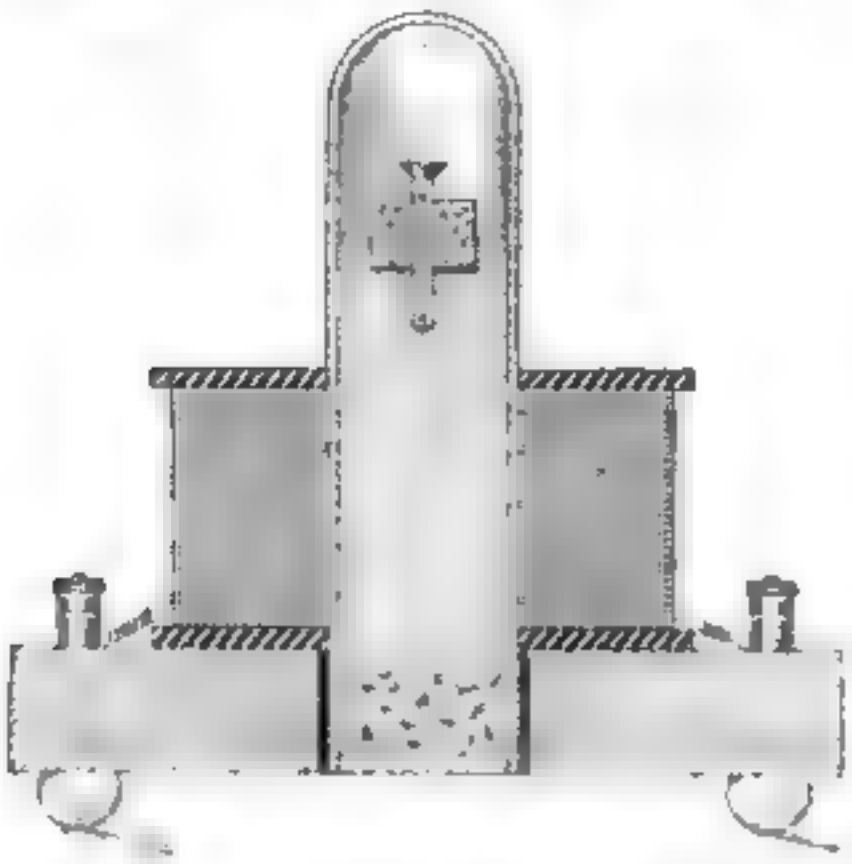
Here Is an Interesting and Artistic Electric Battery Tester

THE battery tester shown is designed to show the condition of electric batteries and will indicate roughly the amount of energy left in any cell. It is very easily constructed, and if the work is carefully done, the instrument will make a handsome and useful addition to any amateur's set of electrical appliances.

Procure a 4-in. test tube. These tubes come in different lengths and the longer the tube the higher the wire coil will be and the more wire will have to be used.

Having selected the tube, measure its outside diameter. Then get a piece of pine board ¾ in. thick and about 5 in. wide. Mark with dividers, a small circle in the center of the board. The circle should be ⅜ in. larger than the outside diameter of the test tube. Also mark a 4½-in. circle concentric to the small one. Bore a hole through the center circle, then cut the wood with a saw or knife as close to the line of the outside circle as possible and finish with sandpaper tacked on a block of wood. Get a small stove bolt or a machine screw and a cork. Punch a hole lengthwise through the center of the cork with a bradawl. Then put the stove bolt through the cork, using a screw driver for the purpose. Allow the bolt to extend more on the bottom than on the top of the cork. The bolt

should then be filed or cut so that the cork will just keep the bolt on the surface of a glass of water. Both the bolt and cork should then be dipped into hot melted paraffin wax so as to leave a thin coating on the surfaces. This keeps the



Current tester, consisting of test tube of water, cork and bolt, all surrounded by coil

cork from becoming saturated with water and also prevents the bolt from rusting.

Now take the test tube and tie it in an upright position to any convenient object. The round end should face toward the bottom. Fill the tube two-thirds full of water and put the cork with its bolt in it. Get a cork of sufficient size to fit the open end of the tube. Dip the cork in shellac, varnish it, then drive it into the tube, so that the side of the tube projects about ⅛ in. above the top of the cork. Let the shellacked cork dry, then fill up the space between the top of the cork and the edges of the tube with plaster of paris or cement—the latter preferred—making it level with the edges of the tube. When it has hardened, take a piece of emery paper and roughen the glass on the sides of the tube for about ½ in. from the end. This is to enable the cement to grip the tube tighter when it is fastened to the base board. Place the base of the instrument on a level surface and put the tube, corked end facing downwards, in the center of the small hole, the end of tube to be flush with the bottom of the base. Then fill the cavity between the sides of the base and the tube with cement, keeping the tube in an upright position until the cement hardens.

The flange holding coil is made from cigar-box wood or other thin material. Nothing is to be gained by making the coil more than three times the diameter of the test tube; that is, if the outside diameter of the tube is 1 in., the total diameter of the coil including the tube will be 3 in. In other words, there will be 1 in. on each side of the tube. Measure the outside diameter of the tube, then mark on the board a circle of the required size and also mark with the dividers, a circle for the outside diameter. If a 1-in. tube is used, the diameter of the flange should be 3¼ in. wide, the ¼ in. oversize being left to extend over the wire coil, as will be seen in the sectional view of the battery tester. Put the wooden flange on the test tube and slide it down to the center (it should fit the tube as tightly as possible), then glue it in place and let it dry. Get ¼ lb. of No. 20 double cotton covered magnet wire and wind a sufficient amount of it on the spool to nearly fill it up, but allow the top flange of the spool to project ⅛ in. on each side of the wire.

In winding the wire, start and finish at the bottom, leaving 6 in. of wire on each side of the spool to connect the magnet with the binding posts, there being one of the latter on each side of the coil. Scrape the insulation off of the connecting wires and insert it under each binding post. The wood work should be enameled so as to make an attractive instrument. The enamel should also be put on the bottom and over the plaster of paris or cement seal and the joints where the tube is flush with the base. Four brass tacks spaced at equal distances should be placed on the bottom of the base. The test tube is then ready for use.

Connect a wire from the zinc of the battery to one binding post and the carbon wire to the other. The cork and bolt will then dip and rise as the circuit is closed and opened. The stronger the battery is, the quicker and deeper the bolt will sink. If the battery is nearly exhausted, the bolt will merely move about on the surface. A very artistic tester can be made by enameling the base of the tester red; coloring the spool flange black, the wire coil green, and the cork and bolt black.

Wireless Work in Wartime

X.—The Non-Synchronous Gap Radio Transmitter

By John V. L. Hogan

HAVING taken up, in the previous article, the general operation of the spark gap and primary oscillation circuit of a typical radio sending station, further and more specific types of spark gap may now be considered. In the illustration Fig. 38, printed last month, was shown a simple fixed air-cooled gap; and

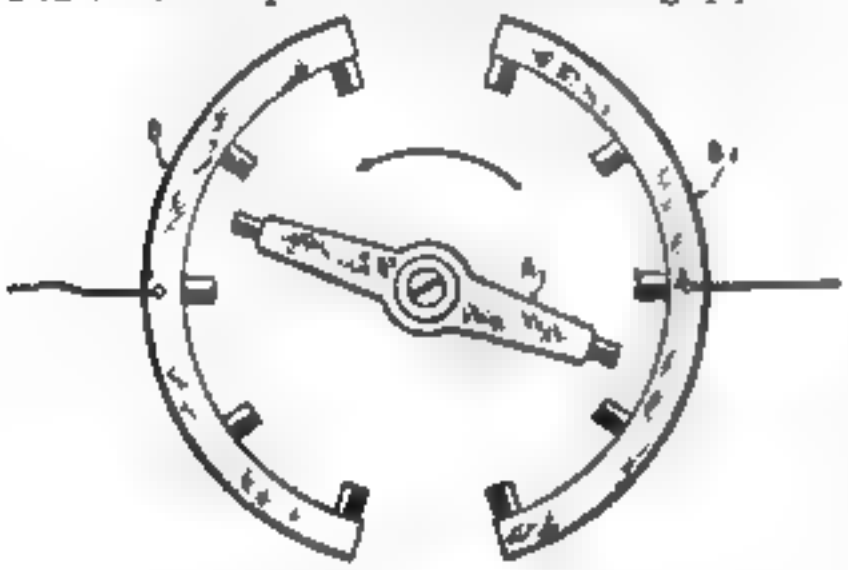


Fig. 39

An old type of a rotary spark gap which has been in general use for some time for wireless

the accompanying Fig. 39 shows a type of rotary spark gap which has had wide use. This consists of a rotating conducting arm *A*, having spark electrodes on both ends and mounted upon a driving shaft so that it may spin between two semi-circular frames *B*, *B*. Supported on the frames are a number (in this instance ten) of fixed, equally-spaced electrodes. The five on one frame are connected together and act as one terminal of the spark gap; the other five form the other terminal, being connected together in the same way. The length of the studs and the separation between them is so chosen that when the rotating arm is almost directly in line with any one pair there will be only two short spark gaps in the circuit. If at this time the transformer (and condenser) voltage is near its maximum, sparks will pass and the condenser will discharge with oscillations, as previously explained. If the rotating arm has passed out from a position almost directly between two stationary studs, however, not even the maximum secondary potential of the transformer can force a spark to jump.

The Disk Rotary Gap

Another type of rotary spark gap is shown in Fig. 40. Here there are two stationary terminals *D* and *E*, and between these there rotates a spoked wheel *F*. Each spoke has a spark gap tip *G* at its outer end; the length of the spokes and their distance apart is selected so that sparks can pass only when they are almost directly in line with the stationary electrodes. It is evident that these two types of rotary spark gap have much in common; in both of them the gap length is continually changing, and in both the gap is cooled and kept clear of conducting gases by the air circulation stirred up by the rotating member.

There are two general ways of using the rotary spark gaps. The gap of Fig. 39 is generally used according to one of these, the "non-synchronous" method, and has consequently come to be known as the non-synchronous rotary gap. The second type, of Fig. 40, has had its widest use according to the second or "synchronous" method, and is therefore often called the synchronous rotary gap. Neither of these names is strictly correct, however,

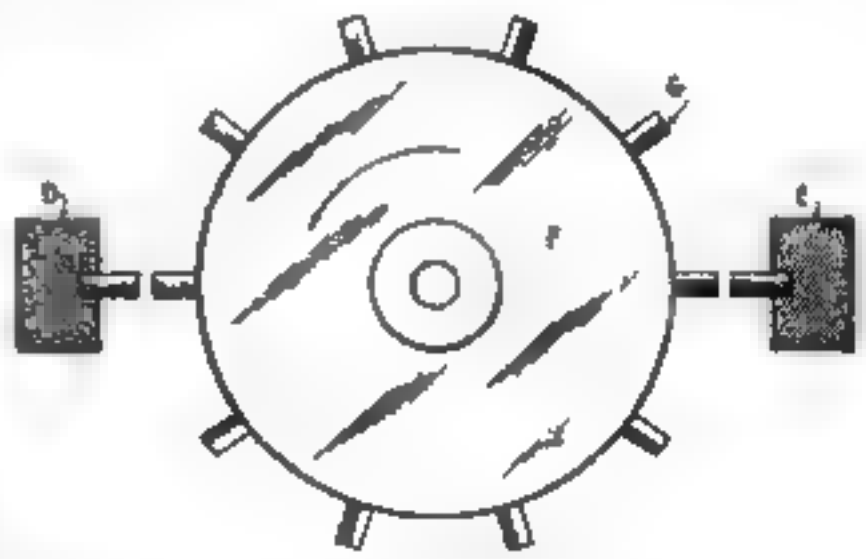


Fig. 40

The second type or synchronous method is usually called the synchronous spark gap

since there is no reason why either gap should not be used according to either the synchronous or non-synchronous method. This will appear from an examination of the two types of operation.

Non-Synchronous Operation

Taking up the non-synchronous discharge first, let us imagine that the rotating part of either gap is revolved by a direct current motor and that its speed of

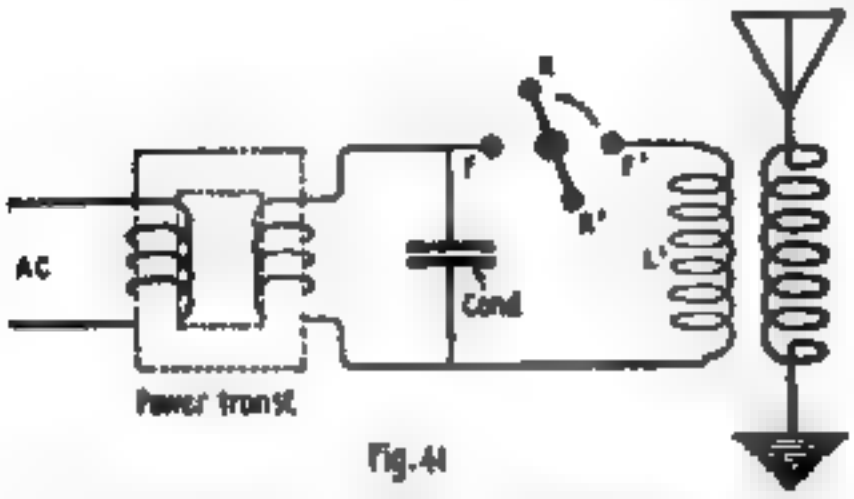


Fig. 41

A diagram of a radio transmitter with a rotary spark gap interposed in the apparatus

rotation has no particular relation to the alternating current supplied to the power transformer in Fig. 41. As the secondary of the transformer charges the condenser, the spark-gap rotating electrodes *R, R,* are constantly moving toward or away from the fixed electrodes *F, F.* If the instant of maximum potential of the transformer should occur while the spark gap contacts are widely separated, no spark would pass and the condenser would discharge back into the transformer secondary on the next half cycle of applied power. If, on the other hand, the spark gap electrodes were quite near together when maximum potential was reached, a spark would pass and a group of radio frequency oscillating currents would be produced in the primary circuit. When the spark gap rotor is driven independently of the applied alternating current power, i.e., non-synchronously, it is evident that the time a spark will pass (and, in fact, whether or not a spark will pass at all) depends entirely upon chance. The only way to be sure that a spark will pass for each half cycle of alternating current applied to the power transformer is to increase the speed or number of electrodes of the rotary gap so that at least one opportunity for sparking will exist near the maximum voltage portion of each half-cycle. In commercial practice this has usually been accomplished by running the spark gap at a speed which corresponds to approximately 600 sparks (or, more strictly, "opportunities to spark") per second when the supply current is of 60 cycles per second frequency. Thus in each half-cycle of secondary voltage there are five instants at which the condenser might discharge across the spark gap, provided only that at each of these times the condenser voltage is higher than the minimum required to break across the shortest spark gap.

How the Condenser Discharge Time Is Varied

How the adjustment of the gap affects the times of sparking may easily be seen by studying Fig. 42. Here the solid curve represents the numerical potential value of the secondary condenser charge, as it is produced by the power transformer and without allowing for effects of withdrawing energy by the spark discharge. The dashed curve above represents the breakdown potentials of the rotating spark gap, and both are drawn for the same successive instants of time. The divisions along the horizontal axis represent time intervals of 1/600 second, and consequently ten of them are contained in two half-cycles or one complete cycle of audio-frequency voltage at 60 cycles per second. The voltage curves are all plotted above the axis, since in this case we are concerned only with the numerical value of the voltage and not at all with its direction—the spark gap will break

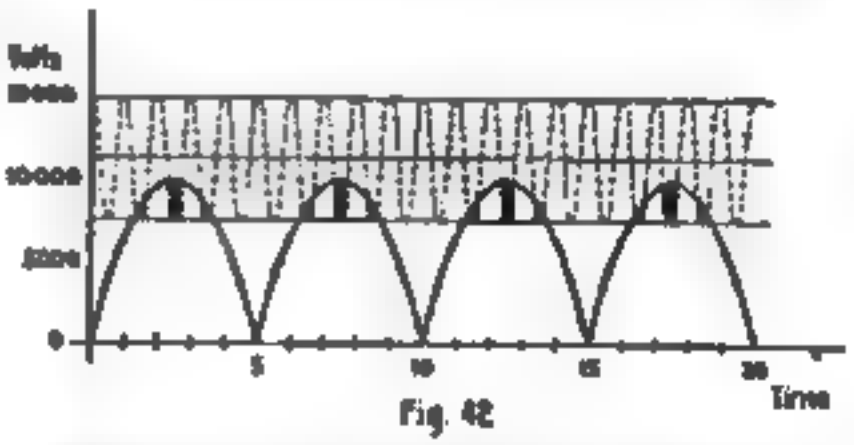


Fig. 42

Curves showing the operation of the non-synchronous spark gap for a wireless set

down whenever the potential rises above a certain approximate value, substantially without regard to the direction of potential stress. The voltage is assumed to vary from zero to ten thousand.

Continuing with Fig. 42, the upper dashed curve may be understood by imagining the successive separations be-

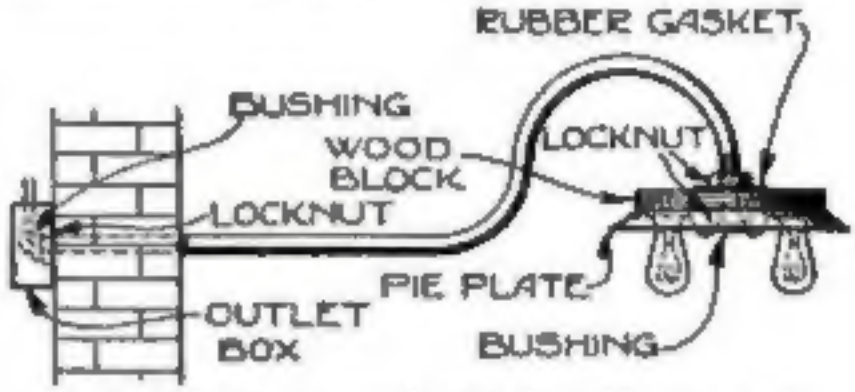
tween the rotating and fixed electrodes of the rotary gap. If the studs are set back so that when the gap is the shortest (i.e., when the electrodes are exactly in line) a voltage of 7,500 is required to cause a spark to jump, and if the design is such that a potential of 15,000 volts would force a spark across even when the electrodes are farthest apart (the moving studs exactly half-way between the fixed), the conditions illustrated in Fig. 42 will be had. The spark gap is supposed to have the number of studs and the speed chosen so that the electrodes approach and recede 600 times per second. The illustration Fig. 42 shows roughly what will happen in four half-cycles under these conditions. The first time the gap becomes closest there will not be enough potential to break it down, so the spark will be missed. The second time will produce a spark, since the secondary condenser will just have reached 7,500 volts. The third spark will pass, as will the fourth. These are indicated by shaded portions where the two voltage curves overlap. The fifth and sixth sparking opportunities will be missed, because the condenser voltage will in neither case be high enough to break across the minimum gap length. At the seventh, eighth and ninth opportunity sparks will occur, and the tenth and eleventh will miss. The twelfth, thirteenth and fourteenth will pass, but the fifteenth and sixteenth will be lost. Thus it is seen that there will be three sparks in each half-cycle, at the distance represented by 1/600 second of time, and that between each group of three sparks there will be an idle interval of 1/200 (3/600) second. If the sparking opportunities do not occur at exactly 1/600 second separation, but slightly less often, there will be two sparks in some half-cycles and three in others.

This will give a fairly complete idea of the rotary gap operating upon the non-synchronous principle. You should go over the details of this type of non-synchronous gap operations until you have firmly in mind the relations of voltage and gap length. The effect of changing various adjustments will be treated next month, when the quenched and rotary synchronous gaps will also be described.

(To be continued.)

How to Make an Efficient Weather-Proof Goose-Neck

A VERY efficient weather-proof goose-neck wall bracket can be easily constructed as shown in the illustration. It consists of a piece of ½-in. conduit bent



A conduit bent and fitted with pie-plate reflector to make a weather-proof goose-neck

in the shape shown and fastened into the wall with a locknut. The outer end has a wood block or disk attached with a locknut and rubber gasket. On the under side of this disk is an inverted pie plate to which the lamp sockets are securely attached.—CHRIS. BACH, JR.

A Temporary Repair for a Slipping Magneto Shaft

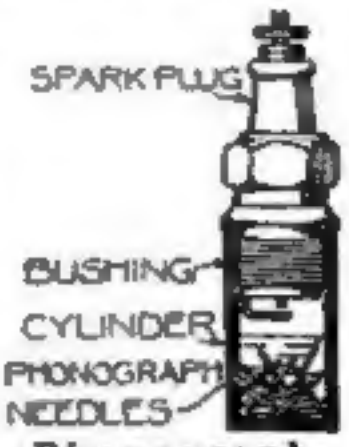
ABOUT the most annoying mishap a driver has to contend with on the road is that of a magneto shaft slipping endways so that the gears will be out of mesh. One cause of this trouble is the pump wheel shearing its pin and allowing the shaft to slip endways and out of mesh with the gears. In order to take the pump off and make the repair it is necessary to remove the starter, and this is entirely too big a job to do on the road.

Placing a cotter in a magneto shaft to keep it from shifting endways out of gear mesh

The repair may be made in a temporary manner as shown in the illustration. A hole drilled through the shaft just in front of the stuffing box, as shown at *A*, provides a way for holding the shaft with a cotter. It is then only necessary to time the distributor, and the engine runs the same as before.—P. P. AVERY.

Cleaning Spark-Plugs with Phonograph Needles

THE usual way to clean spark-plugs is to take them apart and scrub them with a brush after scraping them with a knife. An easier and quicker method is here described. Secure a small cylinder open at one end, into which is fitted a bushing with threads corresponding to those on the ends of the plugs. After filling the cylinder about half full of gasoline, throw in a dozen or more old phonograph needles, then screw the plug in the cylinder. After giving it a good shaking, remove the plug. The end will be thoroughly cleaned, more thoroughly than if it were scrubbed and scraped in the usual way.—PETER J. M. CLUTE.

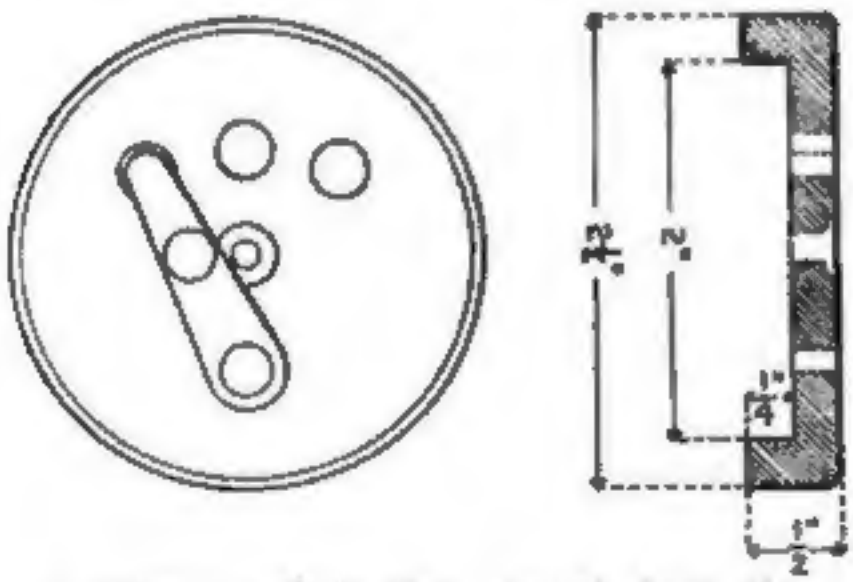


Phonograph needles remove carbon deposit

A Good Permanent Base for Small Battery Switches

NO doubt many an experimenter and many a student in an electrical school has had the misfortune to break the frail wood base of a battery switch. A switch made like the accompanying illustration will last almost indefinitely.

Take a piece of ½-in. fiber, 2½-in. square and place it in the chuck of a small lathe, and recess the bottom 2 in. in diameter and ¼ in. deep, as shown in the sketch. Before removing the fiber from the chuck, drill a 3/16-in. hole in the center, remove it from the chuck and put a 3/16-in. bolt into the center hole and lock it with a nut of the same size. The bolt is then put into the chuck, and the outside is turned round.



A battery switch base turned from fiber makes a substantial mounting for the parts

The radius of the switch lever and the size and the distance apart of the switch point holes must be determined from the style of switch from which the parts are taken.—WALTER B. WEBER.

This Lighthouse Sends Radio Fog Warning Far Out to Sea

POINT JUDITH LIGHT, near Newport, R. I., is now equipped with a radiophone fog-warning machine. The words "Point Judith Light!" are repeated every five seconds and can be heard anywhere within a radius of about eight miles. After every third warning the words "You are getting closer; keep off!" are sent out. These can be heard about two miles away.

Wave lengths keep changing continuously between 550 and 650 meters, in order that operators on passing ships may be more likely to hear the messages even if at the moment they may not be tuned exactly to a standard wavelength. The system is likely to be improved at intervals. All lighthouses could profitably employ such a contrivance if it works out well in practice.

Opera Hat with Enclosed Electric Light for a Sign

FROM a French inventor comes an advertising sign in which an opera hat is its housing. The sides of the hat are cut so that letters are removed that spell out the words of the sign. These letter holes are covered over with a thin light fabric of the same color as the hat. When unlighted the letters remain invisible, but with one or more battery lamps placed inside and lighted, the hat becomes a conspicuous advertisement. The batteries may be carried in the pocket and wired under the coat to the neck and up to the hat over the hair on the back of the head. The current can be flashed on and off with a switch in the coat pocket. This is a real novelty in advertising signs and one which would be sure to attract attention.

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March 18, 1918

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JLW:EJW

Assistant to the Director

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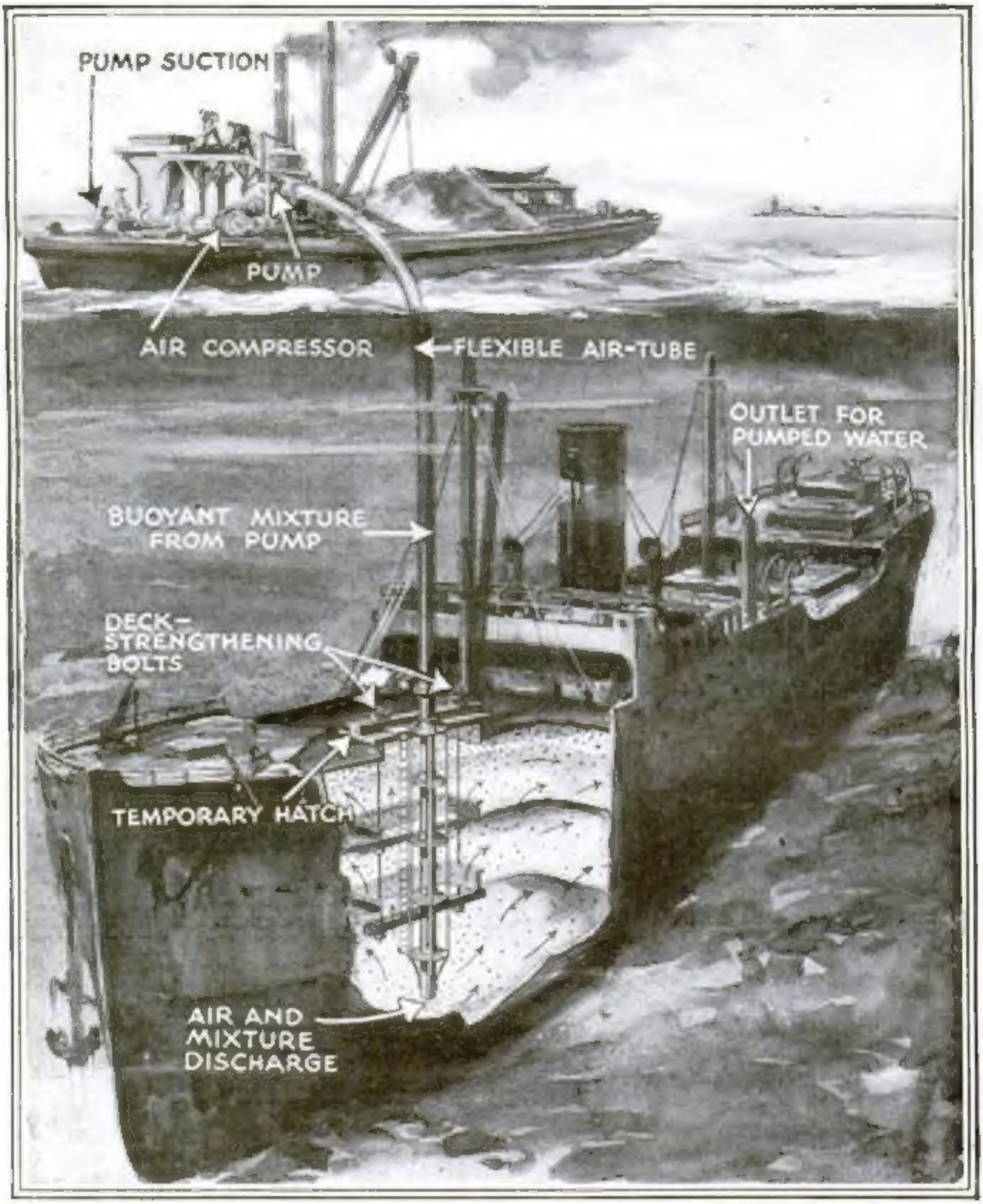
Editors of the Popular Science Monthly.

Salvaging Ships Sunk by Submarines



Raising a Hull by Pumping a Buoyant Mixture Into It

Salvage ships on the surface and section of sunken ship of usual cargo-carrying type below. Connection is made, extending through all three hatchways of the ship to its hold, by a flexible tube secured within another flexible tube and continued within a metal pipe coupled to the latter. The metal pipe is secured to a temporary hatch-cover, with manhole for the upper hatchway, and carries a ladder and working platforms for divers. The entire construction is further reinforced by brace rods wherever they are needed

The inner flexible tube is connected with a centrifugal pump in the salvage ship. A derrick supports the tubing. A suction pipe with a cut-off valve or seacock leads from the centrifugal pump to the open sea. It connects with a hopper that receives the buoyant material. The paraffin comes through a pipe from the paraffin tank where it is kept liquid and heated by a steam coil connected with the ship's boiler. An air pump is connected by a pipe to a space between the outer and the inner flexible tubing